21933
MAR 17

THE AMERICAN GAS LIGHT JOURNAL

REDMANKENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME LIV.—No. 11. Whole No. 823. | NEW YORK, MONDAY, MARCH 16, 1891. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Published on each Monday of the year, at No. 42 Pine Street, N. Y.

Terms of Subscription, Including Postage.—For the United States and Canada, $3 per annum. European countries, $4.50 (19 shillings—22½ francs). All payments to be made in advance. Single copies, 10 cents.

Remittances should be made either by post-office order, express money order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

Collections are invariably made directly from this office, for subscriptions, advertisements, etc. We have agents to solicit the same, but they are not authorized to receipt for money.

Correspondence.—Wishing to make this JOURNAL a gazette of intelligent discussion to those of our readers who may wish to gain or give information on the subjects to which its columns are devoted, correspondence is solicited for publication from all who make the study of those subjects a pleasure or a profession.

The American News Company, Nos. 39 and 41 Chambers street, New York, are agents for this JOURNAL. Newsdealers will send orders to them.

Books.—We will forward by express, at publisher's lowest rates, any book—scientific or otherwise—to any address in the United States or Canada. We would suggest to our patrons that to avoid the risk and expense consequent on sending us the money (we do not send books C.O.D.), that orders for books be sent us through the Purchasing Department of the American Express Company.

CONTENTS.

An Asterisk (*) denotes an illustrated article.

OFFICIAL NOTICE—
Ohio Gas Light Association 361

EDITORIALS—
Briefly Told 362
Obituary: Francis H. Jackson—This Week at Zanesville—The Boston Smelling Committee—Atlanta Would Like to Have More Than the Pound of Flesh.
Twenty-First Annual Meeting of the New England Association of Gas Engineers—Official Report—Revised by the Secretary—Continued from page 333 363
Mr. G. Shepard Page on Residuals—Second Day, Morning Session—The Question Box—"What are the Advantages of the Cartridge Method of Applying Enrichers?"—How Much Can Leakage be Safely Reduced by Governors?"—"What is the Smallest Size Cast Iron Pipe that it is Policy to Lay?"—Is a Gas Company Legally Liable for Damage to Trees Caused by Leakage of Gas?"—Different Methods and Devices for Accomplishing Similar Ends, by H. A. Allyn—Discussion.
Incandescent Gas Lighting 367
*The Jones Gas-Fired Boiler 369
Problems Connected with Indoor Illumination 370
ITEMS OF INTEREST FROM VARIOUS LOCALITIES 371
Reduction in Rates at Fremont, Ohio—Public Lighting, Montreal, Can.—Resignation of Mr. J. B. Howard, Dubuque, Ia.—Fuel Gas at Milwaukee, Wis.—Lawrence (Mass.) Gas Company to Supply Electric Lights in Methuen—Probable Cost of Electric Lighting at Wheeling, W. Va.—Damage Suit at New Orleans, La.—Annual Meeting, Memphis, Tenn.—Fixing Gas Rates at Seattle, Wash.—Suit Against the St. Paul (Minn.) Gas Light Company—Gas Accounts, Richmond, Va.—Reduction at Bangor, Me.—Bay State (Boston, Mass.) Company's Works Visited by City Council—Lighting Bids, Sing Sing, N. Y.—And Many Other Items.
Something About Thermometers 373
The Market for Gas Securities 373

[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF SECRETARY, COLUMBUS, O., Feb. 10, 1891.

To Members of the Ohio Gas Light Association:

Gentlemen—The Seventh Annual Meeting of this Association will be held at Zanesville, O., on March 18 and 19, 1891.

The Clarendon, a first-class hotel, has been selected as the stopping place for our members. Its rate is $3 per day. Those intending to attend the meeting should write well in advance for rooms. *This is important.* In case you should fail to find accommodation at the Clarendon, the Kirk House, famous for its excellent fare, is near at hand.

The sessions of the meeting will be held in a large room, exactly suited to our needs, in an office building at the corner of Sixth and Market streets, on the same lot with the exhibition plant of the Ohio Fuel and Incandescent Lighting Company. It is in a quiet locality, about two blocks from the Clarendon.

The usual exhibit of gas stoves, burners, engines and other appliances and devices of interest to gas men will be held in a large, well lighted room on the ground floor of the Shinnick Building, on Main street, on the direct route between the Clarendon and the convention room. This exhibit promises to constitute a very interesting feature of the meeting.

The following papers have been promised:

1. "The Proper Handling of Oxide of Iron in Purification," by H. W. Douglas, Ann Arbor, Mich.
2. "The Desirability of a Uniform System of Gas Companies' Accounts," by A. P. Lathrop, Columbus, O.
3. "How Small a Works can Profitably Utilize Its Ammoniacal Liquor?" by George Osius, Detroit, Mich.
4. "The Alleged Popular Prejudice against Gas Companies, and How Best to Eradicate it," by Eugene Printz, Zanesville, O.
5. "A Consideration of the Arguments for and against Water Gas, in 1891," by F. H. Shelton, Phila., Pa.
6. "Does Ohio Want a Gas Commission?" by Irvin Butterworth, Columbus, Ohio.
7. "The Present Outlook for Manufactured Fuel Gas," by George H. Christian, Jr., Norwalk, Ohio.
8. "In what Direction shall Gas Companies Look for the Future Cheapening of their Product?" by H. Wilkiemeyer, Portsmouth, Ohio.

In addition to the foregoing papers, a "Question Box," which proved such a profitable and interesting feature of our meeting last year, will be had again this year, to which members are requested to contribute queries.

A good meeting is expected, and all members are earnestly urged to be present, prepared to participate in the discussions. Persons eligible for membership, who are not yet members, are cordially invited to attend this meeting and join the Association. Blanks for applying for membership furnished on application. Respectfully,

IRVIN BUTTERWORTH, Secretary.

[CIRCULAR NO. II.]

COLUMBUS, O., February 16, 1891.

To Manufacturers: Dear Sirs—In connection with the Seventh Annual Meeting of this Association, at Zanesville, O., March 18 and 19, 1891,

there will be an exhibition of gas stoves, burners, engines, and any and all kinds of gas apparatus and other appliances of interest to gas men. You are hereby cordially invited and requested to contribute to this exhibit some article, or articles, in your line of manufacture.

A large and well lighted room, admirably adapted for the purpose, has been secured for this display. It is situated on the ground floor of a building a short distance from the Clarendon Hotel, where most of our members will stop, and on the route from the hotel to the hall in which our meeting will be held. There will be an excellent opportunity for the advantageous display of your specialties to the large number of practical gas men who will be in attendance, as well as to the Zanesville public.

No charge will be made for floor space, nor will exhibitors be at any expense whatever, except freightage to and from Zanesville.

Consignments of goods for the exhibit, and communications with reference thereto, should be sent to Mr. Eugene Printz, Superintendent Gas Light Company, Zanesville, O., who has charge of the display, and who will arrange the articles to the best advantage of all concerned.

Shipments should be made well in advance of the date of the meeting —as early in March as possible. *This is important.*

Respectfully, Irvin Butterworth, Secretary.

BRIEFLY TOLD.

Obituary.—Francis H. Jackson—Our last issue contained a brief announcement of the death, at Atlantic City, N. J., on the 4th inst., of Mr. Francis H. Jackson, whose active business life is intimately linked to and connected with the development of the gas coal resources and trade of the United States. Mr. Jackson was born in Philadelphia, March 8th, 1825, the home of his parents being at 5th and Arch streets, diametrically opposite to the spot where repose the remains of Benjamin Franklin. Educated in the city of his birth, at an early age Mr. Jackson engaged in mercantile pursuits, displaying at once those methodical traits that subsequently enabled him to carry on with marked success a business whose customers were spread the country over. Young Jackson's abilities soon attracted the attention of Philadelphia capitalists, who had bought over the gas coal properties on the Youghiogheny river, and Pennsylvania Railroad, not far from similar deposits worked by Dunlap McLaughlin and Thos. Moore, and in 1857 he was named by them to act as Secretary and Treasurer of the Westmoreland Coal Company. In those days American gas coals did not find very great favor with our gas makers, who preferred seemingly the British trademark, and it was a hard struggle to convince them that Pennsylvania and Virginia could yield coals far superior to the Liverpool and Newcastle varieties that held the American market. Mr. Jackson, however, took hold with no uncertain hand. Finding that these coals were successful in the Philadelphia and Baltimore gas works, he at once directed his energies to developing a wider market for them.

The first extended trial of the Westmoreland coal—for such was the distinctive title applied to it—was made (in the fall of 1857) in the works of the Williamsburgh (Brooklyn) Gas Light Company, and the trial resulted so favorably that the late General Charles Roome, who was a staunch believer in the value of what was known as "Liverpool" gas coal, assisted by the late Mr. Sabbaton, made an exhaustive examination of it in the experimental works of the Manhattan Gas Light Company. They more than confirmed the results obtained previously at Williamsburgh, and the fame of the Youghiogheny basin coals was established.

Indefatigable and persevering, Mr. Jackson's talent was rewarded by the Company in his elevation to the Vice-Presidency (1874), to the Board of Directors (1878), and finally to the Presidency (1884). This position he held until the latter part of 1888, when failing health compelled him to tender his resignation of the office. His associates reluctantly acceded, and it is worthy of note that they only accepted the resignation on condition that the salary should be paid to him to the end.

For years Mr. Jackson had been a sufferer from acute dyspepsia, and his death resulted from heart failure, at the place and time noted above. Deceased was largely interested in the American Gas Company, of Philadelphia, but had not been actively in business since his retirement from the Westmoreland Company.

The funeral services were held at his late residence, in Atlantic City, on the 8th inst., and interment was subsequently made in the Laurel Hill Cemetery, Philadelphia. His wife and children (six in number) survive. A noteworthy incident is that the funeral was held on the day that marked the 66th anniversary of his birth.

Mr. Jackson was a singularly even-tempered man, whose executive ability passed the trying test of many a severe ordeal; for it may well be imagined that miners are not the most reasonable of workmen, that railroads are not noted for their liberality, and that directors of gas companies are not always in touch with contractors. However his straightforward course, reasonable demands, sincerity of purpose, and faithfulness in complying with his contracts, always in the end proved him to be just what he was—a sensible, reliant, honorable man.

We are indebted to Mr. E. H. McCullough, President of the Westmoreland Coal Company, for a copy of the resolutions passed by the Board of Directors on the occasion of Mr. Jackson's retirement, at a stated meeting of the Company, held December 19, 1888:

Resolved, That this Board has heard with the deepest regret the resignation of Mr. Francis H. Jackson, as President and Director of this Company.

Mr. Jackson entered its service May 30, 1857, as Secretary and Treasurer. On June 17, 1874, he was elected Vice-President; on November 26, 1878, he was made a Director; and on April 2, 1884, he was raised to the Presidency.

During his long period of service, his activity, intelligence and unswerving integrity have, in a large measure, contributed to the success of this corporation; and in accepting his resignation the Board desires to place on record its regret that the failing health of Mr. Jackson renders this severance necessary, and to express at the same time its appreciation of his long-continued services.

This Week, at Zanesville.—The Ohio Association will convene this week at Zanesville, and surely the members have scant reason for excusing their non-attendance on the ground that their notification was neither timely nor pronounced. The Secretary has given them repeated warning; but this is hardly the right note to sound in connection with the gathering, since we may take it for granted that President Faben will have a "full house," when his smiling face beams from the commander's position. The programme is a most entertaining one, and the paper list should alone be sufficient to bring out a great attendance. So far as heard from, the exhibition of appliances bids fair to excel that of a year ago, which is saying a great deal. Mr. Printz, who has the matter under his especial care, has seen to it that the display room lacks nothing, either in commodiousness for the exhibitors or in point of convenience or comfort of the visitors.

The Boston Smelling Committee.—The finer senses of some of the residents of the Dorchester district of Boston have been greatly disturbed or perturbed or disordered because of their firm belief that the Dorchester station of the Boston Gas Light Company was nothing else than a factory for the nurturing and diffusion of noxious odors. Their physical welfare was endangered, their noses were assailed, and so on. Their plaints were so prolonged that the members of both branches of the city government, abetted by a delegation from the Board of Health, finally took it into their heads to visit the works and "smell" for themselves. Accordingly, on an early date this month, the aforesaid, to the number of 60 or more, on invitation from the Company, visited the works, with *carte blanche* from the proprietors to poke their noses everywhere and anywhere. When the inspectors finally reassembled, to compare notes, even Councilman Hayes, at whose instigation the investigation resolution was presented in the Council, had to admit that he failed to detect odors that could be classed as "nuisances." Nor did the inspection leave any mark in the shape of a loss of health on any of the party—if the robust way in which they consumed a lunch that had been provided for them might be taken as an indication. Seriously, the aim of the Company's staff has been to carry on its operations with every possible precaution to prevent anything connected therewith from even annoying anyone.

Atlanta Would Like to Have More Than the Pound of Flesh.—In 1855, when Atlanta was not even the center of the "Old South," her authorities granted to certain capitalists an exclusive right to maintain and operate a gas works for a period of 50 years. Not only so, but the authorities agreed to take a certain amount of stock, "to have and to hold," in the new enterprise on behalf of the city. The city also bound itself not to exact taxes from the Company for the first 50 years of its corporate life. Atlanta grew, and so did the Company. Later on, when the "New South" began to unfold its wings, new men came into its management, and an opposition charter was granted. The old Company finally dictated terms to its rival, under which consolidation was effected: meanwhile the city disposed of its stock in the old Company. The consolidated Company elected to operate under the old Company's charter, and no objection was made *at the time*. Now, however, the city steps forward with open hand for taxes, urging that because of the consolidation, the old Company has no legal existence. It is a queer history of deceit and avarice, and brings no credit to Atlanta's rulers.

OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONTINUED FROM PAGE 332.]

TWENTY-FIRST ANNUAL MEETING OF NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 18 AND 19, 1891.

FIRST DAY—AFTERNOON SESSION.

The Chairman introduced Mr. G. Shepard Page, of New York, who spoke as follows:

MR. G. SHEPARD PAGE ON RESIDUALS.

The President—We have with us to-day a gentleman who has not been with us for two or three years, and I know that we shall be pleased to hear what Mr. Page can tell us about residuals. Since he has been away the residual market has taken quite a boom, although I do not mean to imply that his being away had anything to do with the increase in prices.

Mr. Page—Mr. President and Gentlemen: It is a pleasure to meet with you again. The point to which reference has been made by the President, as to the cause of the increased value of residuals, is one of great importance at the present time, and one that is appreciated by those who are fortunate enough still to be distilling coal. It has not so much interest for those who are making water gas exclusively; but I think it can be stated, without fear of contradiction, that the increased value of residuals is causing very many companies that were looking towards making the whole or the larger part of their product by the water gas system to hestitate. The fact that many companies in the United States are receiving for the tar and ammonia almost the entire cost of the coal they are carbonizing, has much to do with it. As much as $1.50 per ton of coal carbonized is being received by some companies in the West, and I think by some three, four or five companies, and perhaps more in the East, for the tar alone. While there has not been anywhere near this advance in value of the ammoniacal liquor, yet certainly a company that has not received 20 cents per ton of coal carbonized is not getting what the ammonia in the coal, if it is all properly obtained in commercial form, should bring them. The value of ammonia, however, is limited, and will continue to be limited by the foreign market price of sulphate of ammonia. That can be laid down here for simply the commission, the freight, and the import duty from the other side, at a figure not far from 3¼ cents per pound. That, therefore, fixes beyond any question the value of the ammoniacal liquor. The cause of the advance in coal tar is due, first, to the larger percentage of gas making by the water gas process; and, second, to the enormous advance and increase in consumption of coal tar products. There are already several establishments using pitch for making briquettes—the artificial fuel. There are large bodies of coal in the west and southwest, which when brought to the surface and exposed to the air very quickly becomes slack. They are very useful for steam purposes, and even for gas making, if they can be held in solid form. They can be put into that condition only by the use of coal tar pitch. Other materials can be used, but coal tar pitch is the best, because it will make steam when combined with the culm or slack. Several American railroads have erected artificial fuel plants; so that a demand has been created for a product which has heretofore been used to a very limited extent on this side; while on the other side nearly all the pitch that is made is used in that way. Certainly over 1,000,000 tons of pitch per annum are used in making fuel briquettes. Many of the railroads in Europe use almost exclusively fuel that is made in this way. They are thus able to utilize the slack, which they could do in no other way so advantageously. But all pitch that is being used for that purpose in this country is now being imported from Liverpool and London. No hard pitch is made here because no anthracene is being produced here now. Furthermore, when distilling tar for pitch, it is difficult to "cut" it back with the oil and obtain a product that is durable for the uses to which most of the pitch is put here, and that is for gravel roofing. However, I am looking forward to a time when the anthracene and the alizarine business will be established here. I have no doubt it is to be located here. We will not continue to pay from five to six million dollars per year to England, France, Germany, Switzerland and Belgium for a product which exists in our own coal tar, and which is required here by our dyers. Works will unquestionably be established. Another great industry is becoming well established in the United States—the creosoting of wood for preservation from decay, and destruction by the marine worm. At the present time ⅓ of the heavy oil of coal tar is used for wood preservation, and large quantities are being imported from the other side. Creosote oil is being shipped from London, around Cape Horn, for use on the Pacific Coast. The use of the liquid, or semi-fluid coal tar for stone pavements which have become so general—putting it in the crevices between the blocks to cement gravel—induces a very large consumption of tar, and in many of the concrete pavements coal tar is used. I know of one company, east of Boston, whose coal tar is going west to Chicago, to be used almost exclusively for that purpose. The consumption of tarred paper, under slate roofs and under weather-boarding, and in a thousand different ways, requires an enormous quantity of coal tar for saturation. Coal tar is being carried 1,200 miles in tank cars, and then used for saturating paper, finding its market then in the West. In the manufacture of the 2-ply and the 3-ply roofing, two layers of tarred paper are caused to adhere by using melted pitch. It is an entirely new industry within the past seven or eight years, and it will continue to use increasing quantities of coal tar. It makes the cheapest roof that can be put upon a house. A large proportion of the roofing in the West, and even to a limited extent in the Eastern and Middle States, is made in that manner. A man can buy the 2-ply or the 3-ply paper, and five or ten gallons of the liquid cement (which is also coal tar with the lighter oil and a part of the heavy oil taken out), and he can find the gravel, or ashes, or cinders near by; and with a brush he can make a roof at a cost of from two to four cents per square foot, and one that will last from three to ten years. Therefore that industry must continue. One of the largest uses of ammoniacal liquor is for artificial ice making. That industry was not born in this country, but it took root here earliest, and has now become of vast importance. In New York, Baltimore, Washington, and scores of other cities and towns it has been found that even in the manufacture of 25 tons of ice per day it can be produced and sold at a profit in competition with natural ice. Cold storage warehouses are increasing, and the majority of them would not be profitable without this artificial refrigeration. The results which have been gained in that direction are such that, no matter how cheap natural ice is, or how easy it can be put into a building, an ice machine which will make 20 different temperatures in 20 different rooms will be preferred. There are all manner of articles, otherwise perishable, which can by artificial refrigeration be kept for one year, two years, or three years. Just under the Brooklyn Bridge, in two of the great arches, there is a cold storage warehouse; and Mr. McLean, of Brooklyn, a well-known drygoods merchant, stops occasionally to call upon his son, who is one of the proprietors, and he will say, "Now, if you please, I will have a chop off of that mutton that was put in here three years and a half ago. I think it is a little sweeter the older it grows." I frequently stood at the great warehouse on the Thames and have seen the barges that have taken out the carcasses of mutton from the big steamers that land them at the docks down below on the Thames, which are stacked up just like cord wood, handled like cord wood, and put under the great arches of the Cannon Street Bridge, in rooms holding 80,000. There you find mutton from New Zealand and South America, artificially frozen at the start, kept frozen on the voyage, stored in those storehouses under the great arches of the bridge, and delivered frozen to the retailers. All the meat that is being sent by Armour, Hammond, Eastman, and other shippers from this side across the ocean, is preserved by artificial means. Hence the demand for the ammoniacal liquor of even the smaller gas works. Add the value of the ammonia to the price of coal tar, and the two added to the receipts for coke, is making a figure on the credit side that has never before been realized. It pays in a constantly increasing number of gas works in this country, not only for the coal, but in some instances for coal and labor. You will pardon me for taking so much of your time. The hour is getting late; but if I may go a little further I may say that I believe very strongly in the union of the two—in obtaining the largest possible quantity of gas from the coal in carbonization, and enriching it by the addition of carbureted water gas. I have no question but that the combination of those two will overcome any objection that may be raised on the part of anyone who is weighing the question, "Shall I continue the manufacture of coal gas?" In the light of the facts which I have given, it seems to me that no one can hesitate how to decide that question. The circumstances must be very exceptional indeed which would make it profitable for the entire manufacture of gas to be by the water gas process. (Applause.)

Mr. Nettleton—I would like to ask Mr. Page a question, and it is this: There are some of us who find it impossible to get $5 per barrel for tar; in fact, I think most of us here in New England find it so. I recently was in a tar works not very far from New York where they were making tar paper. The operation seemed to me very simple. I want to know if the machinery, any of it, or all of it, is patented; and if not, whether it is a difficult operation, and why those of us who cannot get a satisfactory price for our tar should not put up such a plant, run paper through the tar, put it through the rollers, ship it and get the profit that

these tar paper men now receive after buying the tar from us at such prices as they can, going through the process of manufacturing, and paying their office expenses and office help. It seemed to me that the process was so simple that we could very easily do it at our works. Is there any difficulty about branching out in that business?

Mr. Page—I believe there are no patents on the apparatus used at present by those who are saturating tar paper. As Mr. Nettleton says, it is an exceedingly simple process. The dry paper (manufactured partially from woolen rags) comes in rolls, it is put upon a spindle, it is carried through a wrought iron tank, under a roll running at the bottom of the tank, the paper is then carried through press rolls to squeeze out the tar, and then wound up again on a mandril. It is a simple process. But there goes with it the question whether it would be profitable for a gas company to do it. I question whether it would not be found more troublesome to find a market for the product after it was made than to market the coal tar. The customers might not be in the town. If customers could be found to take the entire product in the place where it was manufactured, then no doubt it would be an advantage to the gas company to undertake it; but if customers must be hunted up who will buy it in ton, or half ton, or in 2-ton lots, and buy it at infrequent intervals, I think it would be too much of a tax upon most of the managers of gas works whom I know. They would probably give it up and return to the sale of the coal tar. The price at which the products are sold at present enables the buyers to pay the enhanced value, and yet make a good profit.

Mr. Nettleton—Do you know of anybody in New England or in the Middle States who is selling tar for $5 per barrel at the gas works?

Mr. Page—Not in New England or in the Middle States. The highest price I know of is a little over $4 per barrel, in large quantities.

Mr. Sherman—I would like to ask him what the price of coal tar is in England at the present time.

Mr. Page—Coal tar in England is selling at 40 to 45 cents per ton of coal carbonized.

Mr. Sherman—Is naphtha and oil taken abroad in tank boats?

Mr. Page—The Standard Oil Company is shipping in tank boats.

Mr. Sherman—Then it would be practicable to load those boats with coal tar, bringing them to the tar works in New York and pumping right into the tanks.

Mr. Page—Tank boats which have once had coal tar in them are not fit for oil uses.

Mr. Sherman—My object in rising was to find out what price we could get for our coal tar, and not invite competition. Through some inadvertence or spite towards our business it was put on the free list in the McKinley bill; and I think we ought to look after it. We want to get a price under that at which it can be imported. I think it would be wise for the gas companies here and near New York to put a price on it which would not invite foreign competition. I have not kept track of the English market lately, but a year or two ago it was quite a drug there; but the price which Mr. Page quotes now is a very good price.

Mr. Fette—I am not a member of the Association; but this question which Mr. Sherman asks reminds me of a letter which I have just received from one of the tar roofing companies here, making me an offer for coal tar, in the neighborhood of Boston, of $3.10, including the barrel—the value of the barrel being 50 cents. They say that is the extreme price that they can give, because they are at present importing their material from England at a less price than that. I do not understand that they import the tar, but they import the material that they use for their roofing. That may partly answer Mr. Sherman's question?

Mr. Allyn—I will say that in investigating and looking about to see what we could probably dispose of our tar for this year, I have had one proposition, from one party (it is not necessary to say who it is) I think a perfectly reliable party, of about $3 per barrel for our tar product for three years. He stated that he could hardly afford to make that offer for one year, because if he obtained the product he should put up a plant near us where he could work the tar over; but he said that he would be very happy to make a contract for three years at that price. Our Directors do not feel justified in making a contract for so long a time, for a number of reasons. In the first place they hardly thought they were justified in making a contract so far ahead. There might be a change in the management of the Company during that time, and there might be a possibility, or even a probability of the price advancing still higher than those figures. I was very glad when Mr. Sherman made that inquiry, because the same question occurred to my mind a number of times—where the limit would be if we got the price above a certain figure here; whether it would not invite importations from the other side. Perhaps Mr. Page knows about the quantity produced there much better than we do, and whether water gas is being introduced there sufficiently to reduce the production of tar.

Mr. Fette—Let me say I did not accept that offer.

Mr. Page—I should have added one important fact. A question was asked me by Mr. Taber, and the reference by Mr. Nettleton has brought it to mind. There is a difference in the value of tar, and the range of prices is somewhat affected by that difference. Tar that is made where the regenerative furnace is used is not of so much value as tar made where the ordinary settings are in operation. The latter tar is thin, and is of special value for saturating paper. Indeed, it is almost impossible to saturate paper successfully with tar made where excessive heats are used, as in regenerative furnaces. The paper, when wound together, often sticks, and is then not worth quite so much as cord wood. This is a fact of special importance to the representatives of the smaller gas works (the majority of whom I think use the ordinary styles of settings), because their tar should sell for from 30 to 50 per cent. more than the heavy, thick tars made where the regenerative furnaces are used.

Mr. Lamson—This shows how rapidly changes take place. Two years ago the tar maufacturers in Boston paid 50 cents per barrel for tar at Commercial Point, and they would have been glad to have had us bury the tar, they paying us the money agreed upon, rather than take it away. That was only two or three years ago.

An adjournment, to Thursday, February 19, at 8 A. M., was ordered.

SECOND DAY—FEBRUARY 19—MORNING SESSION.

The Association met at 10 o'clock, A.M.

THE QUESTION-BOX.

The President—We will now open the Question-Box. The following is the first question:

"*What are the advantages of the cartridge method of applying enrichers?*"

I think Mr. Leach has had some experience in this.

Mr. Leach—I think we get better results by the cartridge method than we did formerly when injecting the oil by gravity. The cartridges are made of a piece of 4-inch wrought iron pipe 4½ feet long, one end plugged. We fill it with fine breeze and then pour the oil in at the open end. The breeze absorbs the oil, and it is very easily applied in that way. Knowing just how much oil we put in, we can tell precisely how much is used. The other way (by injection) we could not be sure of the quantity. Sometimes the orifice would be enlarged through the heat, when we would get in more oil than we thought, and it was not properly gasified. We find no trouble with the present method. The same pipe is used over and over again, and we have them in use three months without being used up. The breeze is removed every time, and comes out partially burnt into an ash. It comes out easily. A cartridge is generally put in the middle retort every time we charge three retorts. The benches are 6's. As a result the candle power is more even than with the old method. We use paraffine oil, about 40° B. I do not know how much the candle power is increased, as we have no bar photometer at the office. We have a Jones jet, and are carrying not less than 19 candles all the time at the office by that. The quantity of oil used depends upon the coal. The coal we had been using this last winter was such that we sometimes used five gallons of oil to the ton. When I left home we were getting a little less than 5 feet per pound. With the ordinary coal that we have been obliged to use this winter it has run down as low as 4.25.

Mr. Coffin—We use the same method, and find it easier on the retorts than by the injection process. Under the old method the oil was not thoroughly worked off in two hours after charging, and our mouthpiece and stand-pipe joints leaked badly. The new plan has stopped the latter trouble, and everything now is tight. We use one cartridge to three retorts. I use a 3-inch pipe instead of a 4-inch. We do not take out the breeze as long as it will absorb the gallon of oil. When we do take it out it is coked together. We think we get better results with less oil.

Mr. Leach—I omitted to say that my experience is the same as Mr. Coffin's with regard to the wear and tear of the retorts. We are not now troubled with leakage around the mouthpiece, and it does not act on the retorts. We use finer breeze than Mr. Coffin does.

The President—Will Mr. Fowler give us his experience in the use of oil cartridges?

Mr. Fowler—We have been using oil cartridges for nearly a year, and prefer the cartridge to injecting oil through the mouthpiece. We are using a cartridge which we buy ready made. The end of the pipe is not welded together. A block is inserted at the end of the pipe, and the

pipe is welded on to this block. We like it better than a pipe with welded ends. It is easier for the men to handle.

The President—The next question is—

"*How much can leakage be safely reduced by governors?*"

I judge that the idea of the writer was to ask how much the leakage could be reduced by keeping down the pressure on the street main. How low a point can you safely carry your pressure? Will Mr. Slater give us some points on that? How low do you carry your pressure?

Mr. Slater—I am not an advocate of low pressure in the main. I do not think the pressure on the street main in any particular district ought to be less than two inches, but rather more. We have many manufacturing concerns which use large quantities of gas, and if we reduced the pressure to an inch or an inch and a half we would have complaints coming into the office by the score. We are so situated that we really cannot control the pressure if we wanted to. I do not think so much of it as other gentlemen do who have been in the habit of carrying as low pressure as they could. We would not reduce the pressure to half an inch if we could. Our system of distribution was started by the building of holders all over the city, and all the mains are connected together; so that really we cannot control the pressure.

The President—In my own case I have always believed in carrying the pressure as low as possible. Our holders are all at the works, and large mains run through the streets. Those mains are laid always so as to carry extremely low pressure. We have quite a large day consumption, and we have carried the pressure at one inch without any trouble. We are now carrying the pressure at about 12-tenths. The Thomson-Houston Company use gas for their new building, and with the pressure at 11-tenths at the works they have 12½-tenths. I have no question but that it has considerable effect on our leakage.

Mr. Harbison—What is the effect upon gas stoves when you run under one inch pressure?

The President—We do not have any complaint. Our aim has been to get gas stoves which would work at one inch pressure.

Mr. Slater—One would naturally suppose that the reason why the President wanted to carry a low pressure was because it reduces his unaccounted-for gas in the way of leakage. We infer from that that he had a good many leaks in his mains. We can take it the other way. Instead of reducing the pressure to save that gas, we could look after our mains.

The President—We try to do both. There is another question here bearing on the same point:

"*What is the smallest size cast iron pipe that it is policy to lay?*"

Mr. Stiness—Six-inch.

Mr. Slater—Ditto.

Mr. Jones—Surely, nothing less than 4-inch.

Mr. Neal—I say 4-inch.

The President—In our place we have adopted the policy of laying nothing smaller than 4-inch in the streets.

Mr. Nettleton—Recently I had occasion to look into the methods employed by some Western gas works, and have been surprised to find how much wrought iron pipe is being used for mains through the West, up to 6-inch pipe, particularly in the smaller towns and cities. While they admit that the cost of the pipe is somewhat more, yet they think there is an economy in using it (although it has not been employed long enough to determine the fact), in two ways: First, by the leakage, because the pipe can be made absolutely tight; second, in the cost of laying, for the lengths can be screwed together very much faster, and at a very much less cost, than cast iron pipes can be put together in the ordinary way.

Mr. Jenks—How do they connect the service pipes?

Mr. Nettleton—They tap right in, as we do.

Mr. Lamson—They will have trouble in the end. In small towns it will not be so bad as in cities, but in cities if you lay wrought iron pipes where you are liable to have the ground saturated after a time with urine from horses, the deterioration of wrought iron pipe will be found to be something very considerable. Cast iron pipe will stand it, wrought iron pipe will not; and the time is coming when, if they are laid in city streets, trouble will surely follow.

The President—I have heard it said, as the result of their experience, that the United Gas Improvement Company are going largely into wrought iron mains. Can Mr. Shelton give us any information as to that?

Mr. Shelton—I can perhaps give a little information touching the services. I did not know that we had gone into wrought iron pipes for mains. Of course, for services we have. We have a standard coating that we protect our services with. In reply to Mr. Lamson's suggestion about the deterioration of pipes, and about the necessity of putting wrought iron pipes in the ground, if I were going to lay such pipes I would coat them in the same way. I think the trouble with wrought iron pipes, by reason of their too rapidly giving out, can be overcome in this way, and that it will far more than pay to give them the thin coating that is necessary at the start.

Mr. Lamson—You cannot do that always.

Mr. Shelton—The Company I am connected with adopted some years ago the standard coating used by General Hickenlooper, of Cincinnati. I think some 10 or 12 years ago he looked into that question and formulated a recipe for coating service pipes, which he adopted as a standard, and has used ever since. He claims that the services last indefinitely, hence the coating is very satisfactory. It was satisfactory enough to cause us to adopt it as our standard, and our rule is that no service pipes shall be laid under any circumstance without being coated. It is a solution of rubber, tar, lime and turpentine. It is easily made at the works, and the men can dip enough pipe in a single afternoon to last them for a year. When they lay the pipe they have only to carry the pitch along with a brush, so that whenever the tongs make any nicks in the coating, just before filling in the earth, they can coat it by hand. I do not see why that should not apply to wrought iron pipes of large size. It certainly pays to prepare them in small sizes in that way. I am myself a believer in wrought iron pipe. I think we are coming to it. We would be surprised at the amount of wrought iron pipe used in the West, as Mr. Nettleton says; but they have to be coated in some way. You can save leakage and can make them absolutely tight. You can lay them more quickly, and I think that, by using a coating, eventually, wrought iron pipes will be the thing.

Mr. Allyn—I was intending to bring up a matter which has pretty close connection with this subject. Some of you may know that my original intention was to prepare a paper for this meeting of the Association on the renewal of service pipes and small mains; but about the time that I was intending to commence my paper, Jack Frost commenced to play pranks with our street mains. I have had all the amusement I wanted for the last six weeks, so that I found I would not be able to give to the paper the time and attention it deserved. I wrote a short paper on another subject. While I was contemplating this original paper I received a circular from a firm in Philadelphia, advertising a line of goods which was entirely new to me. I had never heard of the thing before. It struck me so favorably that I requested them to send me a few samples in order that I might show them to the members at this meeting. I only received them yesterday, and with your permission I will read what they say in their circular. I want it distinctly understood, as Mr. Goodwin says, that there is nothing of the "shop" in this. These gentlemen are strangers to me. All I know about them is, as I say, that I received their circular. They say: "We desire to call your attention to lead coating as of great advantage in several ways in your line of business. Wrought iron service pipes may be lead coated and rendered proof against rust or decay from dampness, or from passing through soil having an affinity for iron, which in many cases eats out a service pipe in a few months, swelling the leakage account considerably before the fault is discovered. Sheet iron for roofs and sides of buildings may be lead coated and protected against the action of the smoke and gases in the generator and purifying houses, and, being equally proof against rust from the action of the weather outside, affords a valuable addition to the buildings of a gas plant. We have coated materials for service pipes for gas companies, roofs, smoke stacks and car roofs for railroad companies, and for roofs for buildings for iron furnaces, and in these most trying positions our lead coating has been entirely satisfactory." These samples certainly have a very nice appearance. The pipe is coated, on the inside as well as the outside, with lead. They claim they can coat boiler plates before the boilers are made, and that it acts as a preventive to the formation of scale on the inside of boilers; also, against corrosion on the outside.

Mr. Neal—How much does it add to the cost?

Mr. Allyn—They did not state that. I requested them to do so, but they said that having been in the business for a short time, they had not got a scale of prices that they really cared to send out. Anyone who has had experience in using galvanized pipe must know there is a serious objection to it, while at the same time it certainly has its advantages. We have used nothing for our services for the last 12 years but galvanized pipe, but we often find a lot of pipe in which the fiber of the iron is entirely destroyed by the action of the zinc in galvanizing the pipe. A year or two ago we had a lot of pipe, mostly 1¼-inch, which was rendered so brittle that as soon as the cutter wheel commenced cutting it the pipe flew apart like a piece of glass. We often find pipe in which the galvanizing has been improperly done, or put on at too low a temperature, and we occasionally find pipe which is filled nearly one-half with

the zinc oxide of the pipe; but in spite of this we are still using nothing but galvanized pipe for services.

The President—Another question is—

"*If, through a leak in the gas main, a tree should be killed, is the company legally liable for the loss? and if not, is it generally the custom to pay damages for the same?*"

Mr. Allyn—I am able to answer the first part of the question. I should say that the company was certainly liable; but we never make it a question of law. As soon as we have a report of injury by reason of a gas leak, we tell the party we are very sorry, and give a nursery man an order to replace the tree.

Mr. Stiness—That is the best way.

At the suggestion of the President, Mr. H. A. Allyn read his paper entitled,

DIFFERENT METHODS AND DEVICES FOR ACCOMPLISHING SIMILAR RESULTS.

The organizations representing the gas industry have become so numerous of late, and the meetings of these bodies so frequent, that every question relating to the production and distribution of gas has been written about and discussed, until it seems as if very little remains to be said. We have talked about naphthaline for years, with the result I fear that many of us are as ignorant of its cause and prevention to-day as we were before the discussions took place. This may seem a disagreeable admission to make, but I think it is a fairly correct one. Stopped stand-pipes, iron and lime purification, and regenerative furnaces have each and all been fruitful subjects of discussion at the meetings of this and kindred associations.

It is, therefore, a serious question to solve, when a member of this parental body receives a request, expressed in the imperative mood from our affable and efficient Secretary, to write a paper, kindly leaving it entirely to our good taste and judgment to select a suitable subject—to decide what that subject shall be.

In making the occasional visits that we do to the works of our brother engineers, we very frequently notice that, in many little details, the methods adopted and the tools and implements used are not those we have been accustomed to; and we find ourselves asking the question, "Is our way the best, or is theirs?"

If you happen to point out any particular tool, and venture a criticism, you may rest assured that your friend will insist it is the only one that is fitted for the work, and that he would take none other as a gift.

In looking over the field for a subject for a paper it occurred to me that perhaps we might profitably spend a short time in discussing the different methods and devices for accomplishing similar results. As the retort house is the point where the process of gas making commences, we will imagine ourselves there and "see, what we shall see." It is one of the queer things of this life that, if it is absolutely necessary that a certain thing should be exceptionally well done to ensure satisfactory results, the average man will endeavor, to the best of his ability, to do as little toward the accomplishment of that result as possible. For instance, it is of the utmost importance that the stand-pipes should be thoroughly rammed at every drawing of the retort, in order that there may be no obstruction to the free passage of the gas to the hydraulic main; and, yet, how often do we see stokers barely making a pretence of performing this essential part of the work.

This being the fact, it is important that the rammer used should be so constructed, if the work is done at all, that the desired end will be attained. Let us look at a few of the many rammers which are in daily use, and see if we can decide which is best adapted to the purpose. The first is commonly called the auger rammer, and, as its name implies, closely resembles a carpenter's auger. In my opinion the objections to this tool are, from the fact of its having so many bearing edges, the friction is so great that it becomes necessary to reduce its diameter to about 2½ inches. Now let me inquire what is the advantage of having a seven or eight-inch stand-pipe if you are to make only a 2½ inch opening in the fixed carbon at the bottom of the pipe? For, rest assured, once the rammer has been forced into the pipe, the stoker considers that part of his duty performed, and will make no effort to enlarge the opening. Another style resembles two arrow heads joined at right angles. Still another is simply a flat, diamond-pointed chisel. Of these the former has, I think, considerable merit. From its peculiar shape, it is easily forced into the pipes, and, in withdrawing it, the sharp points chip off the hard pitch from the sides of the pipe. I think, however, an objection to both these rammers lies in the fact that their cutting edges are so narrow that, unless more time is spent than is usually the case, the pitch will only be cut out in notches, leaving it in such a state that the pipe will very quickly become clogged again. The rammer which I think gives the best results has a head consisting of a band of steel, 4½ inches in diameter at the cutting edge, 4 inches at the lower edge, and 2 inches wide, the band being connected with the rod by an arm on either side. Although this rammer makes an opening over 4½ inches in diameter, it is used with less expenditure of labor than many of those in use, from the fact that only the sharp cutting edge comes in contact with the sides of the pipe, and the band being smaller at the bottom than at the top, the annoyance which we often notice of having the rammer jammed in the pipe is avoided, or, if it occurs, a slight shake will free it.

Before we leave the mouthpiece, a word in regard to thoroughly cleaning off the luting at each drawing. Hundreds of lids have been broken or bent by leaving lumps of lime on the surface of the mouthpiece. The cheapest and most convenient tool for this purpose is the ordinary, long-handled garden spade. It costs less than a dollar, and will last a year.

We now come to the drawing rakes. With these, as with the rammers, we have many to choose from. To make use of a slang phrase "You pays your money, and you takes your choice."

In my opinion—mind, I only say in my opinion—the poorest device that I have seen for a rake is one in which the head is made by taking a piece of flat iron, say 10 in. by 2 in. by ½ in., punching a hole in one end and inserting the rod on which a thread has been cut to receive the lock-nuts, one of which is screwed against each side of the head to secure it in place. Now, as I never had one of these rakes in my possession, I have no means of knowing how long they can be used before the head becomes loose. But as I have never seen one in use on which the head was not loose, I infer that their term of "tightness" is of very short duration. Another objection to this rake is, that the lock-nut outside of the head prevents the rake from going into the back corners of the retort as closely as I think is desirable.

Next in order comes a rake very similar to the last, the only difference being that, instead of the head being confined to the rod by nuts, a shoulder is made on the rod, against which the head rests. The rod is then riveted up to secure the head.

As with the other rake, so with this. The constant expansion and contraction of the metal soon causes the head to become loose, and makes it an unhandy and uncomfortable implement to use.

A fairly good rake, probably more generally in use than any other, is made by taking a piece of flat iron, say 16 or 18 inches long, and the desired width and thickness for the head. About 4 inches from one end the iron is bent at right angles, not generally a sharp bend, but a little rounded. The sharp arm is then drawn down to the diameter of the rod to which it is welded. At some works I have seen this style of rake with the head slightly curved.

I suppose we are all agreed that in drawing a retort it is very important the work should be done in the most thorough manner. If a very little coke is left at each draw, carbon will form very rapidly, and, in a very short time, the capacity of the retorts will be greatly reduced. Then follows the scurfing process, which, of course, helps to shorten the existence of the retort.

The rake which, with some slight changes, I have used for the past 12 years, is made in this manner. The head is a flat piece of iron, 12 inches × 3 inches × ¾ inches. These are cut off for us at the rolling mill. To this head, about 1½ inches from the end, we weld a piece of 1½-inch round iron, 18 inches long.

In doing this one end of the rod is upset, and then welded to the head by "jumping it on," as it is called. To this short rod, the rod proper, made from ¾-inch iron, is welded. This form of rake will commend itself, I think, to any who cares to give it a trial.

The head being heavy and rigid, it is readily forced into the mass of coke, the sharp corners go into the angles of the retorts, and its work is thoroughly and quickly done. When the corners are worn off, there is enough stock in the head to dress it over and make it almost as good as new.

In passing, let me briefly call your attention to another device which some of you may not have used. When I went to the works where I am now located, I found that an alleged "new process" had been in use for some months, with the result that nearly all the mouthpiece bolts were burned off, and the mouthpieces were only partially kept in place by having brick piers built under them. As there seemed to be a desire on the part of one of the officials of the Company to continue the use of the process, and as I thought it rather desirable to continue to use mouthpieces, in rebuilding I increased the thickness of the front wall from two to three courses of brick, and, as an additional safeguard, made use of

what we call a dog, to aid in keeping the mouthpiece in position in case the bolts are burned off.

These dogs are made of 1¼-inch × ⅝-inch iron, bent in such a shape that one end is inserted in the nut hole at the top of the retort, elongated for that purpose, while the other end locks over the top of the mouthpiece. We use two of these on each retort. Though we very soon abandoned the before-mentioned process, we have continued the use of the three courses of brick and dogs, and find them beneficial.

I alluded to the fact that carbon sometimes forms in the retort. This being the case, it is necessary to remove it or allow it to accumulate until the retort is filled, as I found was the practice at a works where my attention was called to the matter.

I know of but two really practical methods, steam and hot air. I have used both, and prefer the latter. It is cheaper, does away with the necessity of having steam in the retort house, and, I think, is much less destructive to the retort. There are quite a number of styles of "carbon burners." A pattern in common use, having flat sides and top, with half-circular opening on the under side for the passage of the air, is not well adapted to resist the sudden expansion and contraction to which it must be subjected; the difference in the thickness of the material causes it to very quickly fall to pieces. Have your burners made of a uniform thickness and good results will ensue.

Let me throw out one more hint in connection with the retort house, and we will then move along. I fear some of you may have been tempted at times to make use of a forcible expression, when you have noticed a furnace scoop which had been in use but a few days with the handle worn nearly through from having come in too frequent contact with the top of the door frame. To prevent the necessity for the use of profane language, and at the same time make our scoops last longer, we keep a stock of straps on hand, and, before the scoops have been used, we punch out the two upper rivets, and over the regular strap we rivet a thicker and longer one. This additional strap is made from hoop iron, or, better still, of cheap steel, 2 feet long, 1¼ inches wide and $\frac{1}{16}$ inch thick. It is very quickly made and attached, and will double the life of the shovel.

These may seem small matters, but in these times of cheap gas we must look after the little things.

In the purifying house, by a small expenditure, an appliance may be introduced which will effect a saving in time and labor. By running an overhead track from the storage room to the purifier, connecting the same by suitable switches, and providing a simple running gear for supporting a tub, the material, either oxide or lime, can be much more quickly and easily moved than by the common hand barrows.

In the larger works, where it is acquired to remove and return from 500 to 1,000 bushels of material at each change, the work is wearisome enough at best, but when the purifiers take a notion to "kick" as they sometimes do, and it becomes necessary to make two or three changes in a day, any device which will lighten the labors of the men or expedite the work should be adopted.

I fear I have wearied the Association. I have written much more than I had intended. I have made no mention of the many mechanical appliances that have of late been adopted by many of the larger works. My object was simply to discuss the merits or demerits of the utensils and methods in every day use, and to offer a few suggestions which may perhaps bear good fruit.

Discussion.

Mr. Stiness—Mr. Allyn shows his true-born Yankee nature by not leaving any loop-holes through which we can attack him. His remarks are all plain, matter-of-fact, and call attention to many things which in our daily experience we find exactly as he has stated them. I like to hear those papers once in a while. They lighten us up. It gets us down into the regular, home basis. I think the thanks of the Association are due to him for that very agreeable paper. If he would only write a paper where we could pick him up, perhaps there would be a little more fun in it.

Mr. Sherman—A few years ago, while visiting the Pawtucket works, I noticed what I never saw at any other place—a square-headed retort. I would like to ask Mr. Stiness if he continues to use that style.

Mr. Stiness—I do, and I think if the members of the Association will look into that matter they would never have any but square-headed retorts, as they mean great saving of labor and in fire brick. There is no cutting at all. We save $5 on setting each bench. The 14-inch thickness of the square head is just the thickness of the course of bricks which we have.

Mr. Neal—Is the retort the same price?

Mr. Stiness—The same price exactly. The end where the mouthpiece goes on is built square, all the rest being in the same form.

Mr. Harbison—Are the mouthpieces ⏛ shaped?

Mr. Stiness—You can have them ⏛ shape, or flat or oval, just as you please. This square-head is all on the outside of the retort. It simply conforms to the brick work.

The President—I can endorse what Mr. Stiness says about these retorts. I have used them for a couple of years, and find them to be quite an advantage over the old system.

Mr. Wood—Is there any difficulty about the side holes for the bolts, or dropping in the nut?

Mr. Stiness—No. None at all.

Mr. Lamson—Speaking of the square-head retort brings to my mind the fact that Darius Davidson had a scheme for making a square place on the retort wherever the saddles were to come; and the saddles were built on the retorts. I had forgotten all about it; but at the time that thing was in use I thought it might be a good scheme. I suppose some objection to it was found, as it has not come into general use.

Mr. Stiness—I think that was what led me to make the square-head. I had used the Davidson retort, and found that those square-backs where the saddles came were of very great advantage. I simply carried it forward, and made the whole thing complete. I want to refer to one other point. We have come to standard unions for meters; but I want to submit to the Association the advantages of adopting a standard template for retorts, so that, when starting from the top, the two bolt holes will be equally distant from the center. Thus, in the retorts made by Mr. Weber, for instance, in accordance with a standard template, the bolt holes will be the same as those of other makers, and one mouthpiece would fit retorts of all makes. I think if the retort makers would take this into consideration, something could be done. If members will think that over they will readily see the advantage. I hope the manufacturers can be induced to make a standard template for the mouths of retorts. I will, at the next meeting, bring here a plan which I have and show it to the members. It is a subject worth the attention of retort builders.

On motion of Mr. Lamson the thanks of the Association were voted to Mr. Allyn.

(To be continued.)

Incandescent Gas Lighting.

The London *Journal* reports the following summary of the proceedings from a meeting of the London Section of the Society of Chemical Industry (held in mid-February), at Burlington House. Mr. W. Mackean, Chemist of the Incandescent Gas Light Company, read a paper on the above subject. It was illustrated by a number of Welsbach lights, a Fahnehjelm comb, and a Clamond light in operation.

Mr. Mackean, in his opening remarks, said there was no doubt that the question of gas lighting was at the present time attracting a great deal of attention. The pure atmosphere and the steady brilliant light maintained where electric lighting was employed was so much in advance of the impure atmosphere and unsteady flame resulting from the use of coal gas, that it was not surprising the former was much more appreciated; but the high price of electric lighting gave gas such an advantage as to almost defy competition for household illumination. A demand had consequently sprung up for a higher standard of lighting power from coal gas, which should as far as possible possess the many advantages of the electric light in point of brilliancy and steadiness and the maintaining of a comparatively cool atmosphere. The production of light for illuminating purposes from refractory materials, such as platinum, iridium, or the oxides of zirconium, magnesium, etc., was not entirely new; but their adoption for ordinary household illumination had only recently been attempted with any degree of success. The author especially mentioned the Welsbach, Clamond, and the Lewis-Sellon lights as instances of attempts to apply incandescent lighting to ordinary domestic illumination. The Welsbach mantle was composed of the oxides of the rarer earths, such as zirconia, thorina, and yttria; and he proceeded to explain in detail how the mantle and burner were constructed.

By altering the nature of the composition of the fluid employed in the manufacture of the mantles, the author said, the light obtained could be varied from an intense white light to a golden yellow or greenish color, which differed to a certain extent in their diffusive power. He here gave the various percentages of oxides required to produce white light, yellow light, orange light, and green light; remarking that the most effective mantles as to the duration of light were composed of the following oxides: Zirconium, lanthanum, thorium and cerium, to which a small quantity of yttrium might also be added. Mantles made of this composition lasted from 800 to 1,000 hours. The duration of the illum-

inating power varied considerably according to the nature of the fluid employed—a curious fact being that the diminution of the illuminating power was very gradual, as a rule, after 500 hours' burning. The light was then much whiter in color than when first used. Mr. Mackean read a tabulated statement showing the loss in the illuminating power of the mantles during 1,000 hours' burning. In one set of his figures, the lights, consuming 2½ cubic feet of gas per hour, at 1-inch pressure, gave an illuminating power of 23.2 candles at starting. After 100 hours' burning, the illuminating power was 22 candles, and the figures showed a gradual diminution to 16 candles after 900 to 1,000 hours' burning—the total difference between these figures being 7.2 candles, or 31 per cent. The mantles which gave a light of a slightly yellow tint afforded a much higher illuminating power than those of a pure white light, and lasted much longer. Some figures were also given showing the results obtained with two white lights and two yellow lights burning 2½ cubic feet of gas at 1 inch pressure. In the case of the white lights, the original candle power was 17.6 and 16.8; after burning 500 hours, 5.4 and 5.6; and after burning 1,000 hours, 4.3 and 4.5. With the yellow lights the figures were respectively 25.6 and 27.2 candles; 18.0 and 17.6 candles; and 13.7 and 13 candles. The illuminating power of the different oxides, it was remarked, varied considerably both in color and intensity; and a table showing the color and intensity of the light from the different oxides was read.

Speaking of the manufacture of the mantles, Mr. Mackean said that to obtain a good illuminating power it was absolutely necessary to have the salts as free from impurities as possible, and special care had to be taken to get rid of the least trace of iron, the presence of which greatly affected the illuminating power. Perfect combustion of the gas, he pointed out, should also be carefully obtained, as if too much gas was used the flame smoked, the illuminating power was considerably reduced, and a deposit of carbon took place inside the mantle, which often resulted in its destruction. It was necessary that the flame of the Bunsen burner used should be inside the mantle to obtain the highest illuminating power, as the presence of air or oxygen was necessary to procure good results. A brief description of the construction of the Clamond, Lewis, and Sellon lights was also included in this portion of the paper. With regard to the first-named light, the author stated that the illuminating power obtained when at its best was 5 candles per cubic foot; the chief drawback being the short life of the hood, which burned out in about 100 hours. As to the Lewis light, he mentioned that the hood was brought to a high state of incandescence, and emitted an illuminating power of 200 candles when consuming about 40 cubic feet of gas per hour; adding that it was well suited for outside purposes or large buildings.

Referring to the attempts which have been made to carburet water gas, Mr. Mackean said they had not met with such success as to lead to their general adoption. The Fahnehjelm system, in which magnesia "combs" are used, was being extensively employed. One drawback of this system, however, according to the author, was the short duration of the comb, its life being only from 50 to 100 hours. Mr. Mackean said he had hoped, in company with Mr. Scudder, to have been able to put before the members of the Society some improvements on the system of incandescent lighting by means of water gas. Unfortunately, the experiments were not yet completed; but he hoped to place them before the Society at some future date.

Before concluding his paper, Mr. Mackean referred to some of the difficulties which would have to be overcome before any system of incandescent lighting could be considered a success for ordinary use. In the first place, the existing fittings should not be interfered with, except so far as the burner was concerned. The system must give a superior light to the ordinary gas flame. No separate service pipes must be required; and the arrangement of the system must be as simple as with ordinary gas lighting. The consumption of gas should not be increased, but, on the contrary, there should be a marked saving. The combustion of the gas burned must be more perfect than with the ordinary gas burner, in order to reduce the objectionable and destructive effects of the gas consumed. The atmosphere must be comparatively cool, and the light must not greatly deteriorate by the use of the illuminating medium. He pointed out that, in the case of the various lights to which he had referred, the existing fittings were not interfered with; but at the same time a good pressure of gas was necessary to procure satisfactory results.

He admitted that none of the systems alluded to fulfilled the conditions of ordinary gas burners as regarded the simplicity of the arrangement; but a higher candle power per cubic foot was obtained, and the combustion of the gas being perfect, discoloration of ceilings was much less. He had no doubt that considerable progress would be made with incandescent gas lighting, and that in the future it would prove a serious competitor to the electric light for domestic lighting.

In the course of the discussion,

Mr. Scudder, of the British Water Gas Syndicate, said he had hoped that evening to have been able to show some improvements in the application of water gas for illuminating purposes. Unfortunately, however, their experiments had not gone so far as to enable them at present to give any results. He might, however, remark that in 1888 a paper was read before the Society by Mr. Wilson, on the Fahnehjelm comb; and that was his only excuse for introducing it to the notice of the members that evening. During last autumn he went to America to investigate water gas; and while out there, he came across the Fahnehjelm comb, which was slightly different to the comb used in England, which was imported from Essen, in Germany. This comb gave a very intense white light; and Mr. Wilson stated that it emitted a light of 3.5 candles per cubic foot of gas consumed. The American comb he (Mr. Scudder) tested gave a light of 5 candles per cubic foot of gas. He was much struck by this increase of illuminating power; and he investigated the matter. He found that the American combs underwent a second treatment after being manufactured. They consisted of a number of needles of pure magnesia, which gave an intense white light; but they were afterwards dipped into a solution of chromate of potash and allowed to dry, and this made the light yellow. [Mr. Scudder here read an extract from Mr. Wilson's paper, an abstract of which, it may be mentioned, was given in the *Journal* for March 27, 1888. He also quoted the results of some experiments from the paper, which showed that, with a flat-flame burner, the units of heat per cubic foot of gas burned were 694, and a light of 2 candle was given; being 347 units of heat per candle. With an Argand burner, 694 units of heat gave an illuminating power of 2.2 candles; being 315 units per candle. With a Welsbach light, 694 units of heat gave 7 candles; being 99 units per candle. With a Fahnehjelm comb, 293 units of heat gave 3.5 candles; being 83 units per candle.]

Continuing, Mr. Scudder said it was found that the German comb deteriorated considerably. When burning at the rate of 5 cubic feet per hour, it would only last 100 hours. In the American comb, the needles were a little shorter; and they burned for at least 150 hours with a consumption of 5 cubic feet per hour. He had also tried a Welsbach mantle with water gas; but he had to alter the arrangement of the cone so as to burn the gas to the best advantage. For 1 cubic foot of gas he obtained 7 candles.

Mr. Bernard Dyer remarked that he was very much interested in the question of the deterioration of the light with the Welsbach mantles, because, some 3 or 4 years ago, he tried them in his laboratory. For a week or two the light was very satifactory; but then the illuminating power rapidly diminished, and in about three weeks' time the lights were of no use at all. No doubt this was due to some extent to the effect of the chemical vapors that were present in the laboratory, because at the same time he started using these lights he had some fixed in his private house, and two of them lasted 3 years in constant use. He returned one of these to the Company, after it had done service for this length of time, during which it gave excellent illuminating power. This led him to think that there must have been something in the fumes of the laboratory which affected the mantles, and which perhaps would throw some light upon the rapid diminution of the illuminating power. These lights certainly preserved the ceilings of the rooms in which they were used; and they were very comfortable to read by.

Mr. Anderson, speaking in reference to the chemical changes which took place in the mantle and deteriorated the light, said that it occurred to him that the oxides were in time reduced to a metallic condition by being subject to the reducing flame instead of the oxidizing flame.

Mr. A. H. Allen asked whether the author of the paper would give a short idea of the way in which the salts were separated from the earths. He supposed from what Mr. Dyer said as to returning one of his mantles, that they were re-worked in some way; and he should like to know whether the rare oxides, after being used at a white heat for such a length of time, passed into a highly insoluble state. If it were not so, he presumed it would be easy to resolve them into nitric acid.

Mr. Sutherland said that he thought Mr. Mackean had been too modest in his paper, and had not spoken of the difficulties connected with the separation of the metals to which Mr. Allen had referred; and which, he believed, he had satisfactorily overcome. It was a fact that he reworked the mantles after they had been in use; and perhaps it would be interesting to know that he had had mantles returned from Germany and had been able to re-use them. This, of course, saved Mr. Mackean's Company a good deal of money. Mr. Sutherland also spoke highly of the value of the white light obtained by the Welsbach system for titra-

tion work; and expressed his regret that Mr. Mckean had not been able to complete his experiments with water gas.

Mr. Morrison said that he could confirm the results obtained by Mr. Mackean as to the high illuminating power of the Welsbach light. He had himself obtained 28 and 29 candles by burning 2¼ cubic feet of Scotch gas. He did not know that this could be realized with English gas.

Mr. David Howard expressed a hope that the question of the diffusibility of the Welsbach light would be followed up. It seemed to him that if these incandescent lamps came into general use, the public would at once take infinite pains to make elaborate screens to keep the light out of their eyes.

Mr. Mackean, in his reply, first referred to the great difficulty which was originally experienced in extracting the salts from their ores; and also the high prices which they had to pay for them, but which had now been reduced. He proceeded to describe at length the process he used for extracting the salts by dissolving them in commercial hydrochloric acid, separating the impurities and bringing them to a state suitable for the preparation of the mantles. As to the working of old mantles, he had a method by which the salts could be separated one from the other and then re-mixed for use again. With regard to the cause of the diminution of light given by the mantle, he stated that this was found to be due to a great extent to the loss of the lanthanum. The illuminating power also rapidly decreased if there was not enough air admitted into the burner.

A vote of thanks was accorded to Mr. Mackean for his paper.

The Jones Gas-Fired Boiler.

On Feb. 10 U. S. Letters Patent (No. 445,999) were granted to Edward C. Jones, Boston, Mass., for improvements devised by him in respect to the construction and operation of gas-fired boilers. In the specification the inventor says:

Fig. 1 represents a central longitudinal section of the invention; Fig. 2 represents a cross-section on the line *X X* shown in Fig. 1; Fig 3 represents a cross-section on the line *Y Y*, also shown in Fig. 1; and Fig. 4 represents a modification of the invention as applied to a battery or group of boilers. Similar letters refer to similar parts wherever they occur on the different parts of the drawings.

In the drawings, *A* represents a steam boiler of any well-known form or construction, and *B* represents the brickwork in which the same is set. *C* is the flue or chamber below the boiler, and *C'* is the forward part thereof, or what is generally termed the "fire box." *D* is the bridge, and *E* is the grate. *F* represents the ordinary ashpit below the grate *E*. *G* and *H* represent, respectively, the doors in front of the fire box and ashpit. *I* is the combustion chamber, which is separated from the flue or chamber *C* by means of the horizontal wall or flame-plate *K*, as shown in Figs. 1 and 3. From the forward end of the combustion chamber *I* leads a vertical conduit *I'*, connected by means of horizontal passages *i i* to the rear of the fire box *C'*, as shown in Fig. 1.

Within the rear portion of the combustion chamber *I* are located the respective air and gas supply pipes *L* and *M*, which are preferably made long enough to extend the whole width of the combustion chamber *I*, as shown in Fig. 3. The outer or supply ends of said air or gas pipes are provided with respective suitable valves or cut-offs *l m* (shown in Fig. 3), by means of which the amount of air and gas supplied to the combustion chamber is regulated or altogether cut off, as may be desired. The air pipe *L* is connected directly with the atmosphere outside of the combustion chamber, and the gas supply pipe *M* is connected to the gas main or other source of producer or other fuel gas in any well-known manner.

In devices of this kind it is very desirable that the supply of air and gas should each be equal throughout the width of the combustion chamber, so as to prevent one side of the latter from being heated more than the other, and for this purpose I provide the said air and gas supply pipes *L M* with the respective tapering delivery vents or burners *L' M'*, which latter are made gradually increased from the direction of supply, as shown by arrows in Fig. 3. The object of making said vents or burners gradually increased in the direction of the air and gas supplies is for the purpose of producing an equal delivery throughout the length of said air and gas pipes independent of the resistance in the same, by which I obtain a uniform heat and combustion of the combined gases throughout the entire width of the combustion chamber.

In front of the gas supply pipes *M*, I have shown a small gas pipe *m'*, Figs. 1 and 3, the escaping gas of which may be ignited for the purpose of igniting the air and gas escaping into the combustion chamber from the vents of burners *L' M'*.

N represents a door or gate covering an opening in the side of the combustion chamber *I*, through which the combustion of the gases may be ascertained or the gas ignited, as may be desired.

In practice I prefer to arrange on the flame-plate *K* a bridge *k* for the purpose of bringing the heated products in more intimate contact with the under side of the boiler A, as shown in Fig. 1.

During the operation of the device the doors *G* and *H* are kept closed. The air and fuel gas are admitted into the combustion chamber *I* through the respective tapering vents or burners *L' M'* and there ignited, causing an equal supply throughout the entire width of the combustion chamber,

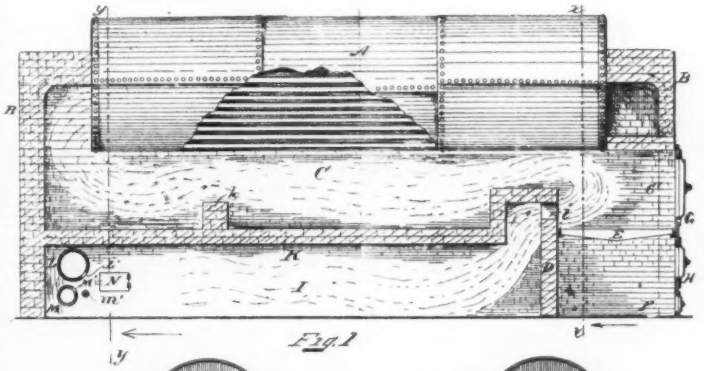


Fig. 1

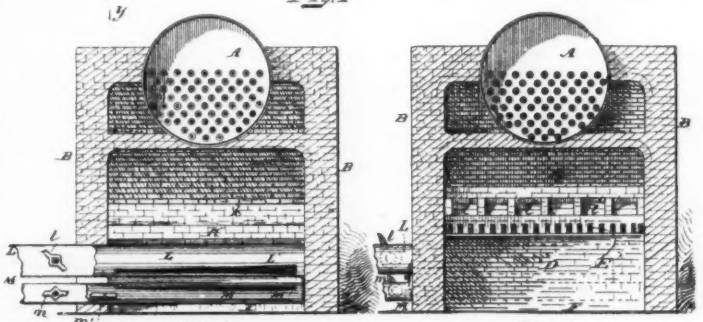


Fig. 3 Fig. 2.

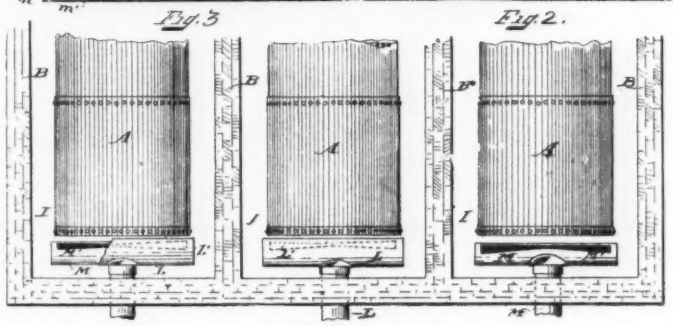


Fig. 4.

and the union and combination of such gases being ignited cause the flame to pass forward through the combustion chamber, up through the conduit *I'*, and out through the passages *i i* into the fire-box *C'*, and from the latter, as heated products, into the flue *C* below the boiler, and through the heating flues to the chimney, by which the best and increased heating results are obtained.

In Fig. 4 a battery or group of boilers, is shown side by side. In such arrangement of boilers it is not always convenient to supply the air and gas at one side of the combustion chamber, and it may be necessary to use a center supply of air and gas, and in such cases I make the vents or burners tapering in opposite directions from the air or gas supplies, so as to produce an equal delivery of air and gas throughout the width of the combustion chamber, irrespective of the resistance in the said air and gas supply pipes. In all cases, however, it will be noticed that the vents or burners are made increasing in area in proportion as they recede from the source of supply, so as to increase the area of such vents or burners in the proportion to the frictional resistance of the gases in the air and gas supply pipes.

THE expert appointed by the city to determine whether the Milwaukee Gas Company was using a burner in the street lamps calculated to pass less gas than that called for in the public lighting contract specifications, has made his report. He finds that the burners are as they should be. The only ones who looked for a different result are a few disgruntled maligners, who should be prosecuted for the maliciousness of their charges.

Problems Connected With Indoor Illumination.

The London *Electrician* recently indulged in the following speculations respecting this subject:

Physiological questions do not often come into the work of an electrical engineer, but the whole object of electric lighting, except from the photographer's point of view, is to stimulate the optic nerves of those who make use of it. Optic nerves have, indeed, been stimulated, not wisely but too well, by naked arcs and badly-arranged glow lamps; and electric light has been condemned freely, and not unreasonably, as being injurious to eyesight, and, what is far worse, "unbecoming" to dresses and complexion. If electrical engineers could take up the position assumed by the electric supply companies, and restrict themselves to providing and distributing electrical energy, they would not be called upon to step out of their legitimate work. But those who are engaged in electric lighting have to supply lamps, and if these be glow lamps, they can, at present, neither get nor give any guarantee of their quality, efficiency, or life; and if arc lamps, they take refuge behind a "nominal candle power," the ambiguity of which is largely due to the disparity between the illuminating power of the arc and of the standard candle, in terms of which it is expressed. And with these lamps they have to provide the best illumination that they can. This optic nerve is, however, difficult to please, and it is not clear whether it alone is the arbiter, or whether the eye, of which it is the essential part, is to be satisfied, or whether, after all, the decision as to the quality and degree of illumination is to be referred to the judgment of the owner of the said eye. At any rate, the estimation of illumination comes to be a mere matter of opinion, and this, for several reasons, is much to be regretted. There will probably be a real objective standard of light before long; whether this will be supplied by a radiometer, a photo-electric cell, a photo-chemical eudiometer, or otherwise, we cannot yet predict. But of the illumination of a dining room, a street, or a stage, we can never hope to have an accurate measurement in C.G.S. or any other units. We have a unit of illumination, and the result of a number of measurements were given in articles in the *Electrician* of 15th August, 1890; but illumination measured quantitatively is not everything.

In electric lighting for domestic purposes, there is an æsthetic side of the question, which must be considered. Difficult as it at first appears, it need not be approached by the engineer with so much caution as the wider æsthetic considerations of the design and treatment of fittings. Glow lamps may be arranged for domestic use according to three different systems, and these are, of course, applicable to all other kinds of lighting, although the requirements are elsewhere not so exacting. The most luxurious and expensive method is that in which the lamps are screened from the eye, while they cast their light upon the walls or ceilings, and are thence reflected generally over the room. The ceilings being rarely, and the walls never, of a pure white, and the reflecting power of their surface being small, a large amount of light must necessarily be wasted, and the effect is not good unless a considerable number of lamps are used, and are carefully arranged, so that the illuminated surface is lighted with uniformity. This kind of illumination can without much difficulty be realized in a dining room by throwing the light upon the table, while the lamps are carefully screened by a suitable shade, and we understand that if the screening is so well carried out that the guests do not realize that electric light is being used, this lighting is sometimes admitted to be "becoming." Where the illumination is not general, but special, as for lighting a particular picture, all that need be done is to place the lamp or lamps so that a tolerably uniform illumination is obtained without reflections from its surface, and with the lamps hid by reflectors. When the lamps are themselves visible the question arises, Shall they be subdued by more or less translucent shades, or shall they be allowed to shed their light direct?

The prejudice against arc lighting as a pleasant kind of illumination is too deeply rooted in this country to make it worth while discussing. True, we do not see so much of those pyrotechnic corruscations, those gleams of violet and flashes of blue, the fitful blink followed by a hiss and yellow flame that runs around the carbon; true, that we have arcs which are "absolutely steady" as compared with other arcs, and more steady than many gas burners; but great improvements must be made in both lamps and carbons before they can be admitted for interior use. But even with an "absolutely steady" arc, it is obvious that it would have to be screened by an opal globe, to diminish the shadows and to prevent discomfort to the eye. For the same purposes, though to a much smaller degree, some such precautions must be taken with any light if it be more powerful than a candle, and it is strange that while a gas or oil burner is rarely seen in any situation, where comfort and appearances are studied, without some shade to soften the light, electric lights are too frequently used without any attempt whatever to diffuse the rays emitted by them.

General Webber recently extolled the advantages of 8 candle lamps over 16-candle, and condemned the use of "sunbeam" lamps for shop windows. He denounced "the other and equally unreasoning extreme of procednre by which light is wasted foolishly in frosting bulbs, or inclosing them in obscured or colored globes." Professor Forbes, in the discussion, made the extraordinary assertion that frosted, *i.e.*, ground glass globes, absorbed little, if any, light, and attributed the observed loss to dirt upon the surface. To discuss these statements in full would require several columns, and we will only allude to the chief points. The dazzling, which is so intense in an arc, is far less, but not absent from a 16-candle lamp, and whatever may be its value, it is only one-half as great in an 8-candle lamp. Two 8-candle lamps, then, give the same light as one 16 candle, but with less dazzling; and if they can be placed at some distance apart, they will give a better distribution of illumination. But the first cost of wiring, and the cost of lamp renewals and risk of breakage are doubled. There are many cases where these considerations altogether outweigh any questions of comfort, and for many purposes the economy of a few powerful lamps is so great that it is worth while studying means for securing a certain degree of comfort without incurring needless expense. The use of powerful argand gas burners inclosed in brilliant reflectors is familiar to everybody. They are most inconvenient excrescences for the passer-by, and when electric light is used, there is less occasion for putting them out of doors. To induce shop keepers to use glow lamps, we should certainly recommend the use of lamps not less than 32 candles, screened from direct view, either by metallic or thick opal reflectors. So far do considerations of comfort weigh with some persons that it has even been urged that a given number of 16-candle lamps may be replaced by 8-candle without affecting the illumination. We will readily admit that a better distribution might be obtained by the use of 30 8-candle lamps, instead 20 16-candle lamps, although the aggregate light would be less; but to assert that the illlumination, say at the Society of Arts (where the lamps are so high up that dazzling need not be considered), would be the same if the candle power of each lamp were reduced to one-half, is too absurd a statement to require refutation. But apart from the facilities for better distribution of light, the demand for frosted bulbs arises from the same causes as the preference for 8-candle power lamp—viz., there is less dazzling. If the reduction of size were carried far enough, there would be no need for frosting, and the ideal lighting of a well decorated room, by wax candles, might be closely imitated by employing an immense number of small lamps.

But leaving the question of illumination, and coming to matters of comfort, we are on the verge of, if not beyond, the limits of the business of an engineer, and we will only briefly allude to the means, and say nothing of the ends attained. Professor Forbes must have been deeply plunged in purely scientific speculation when he said that ground glass practically did not obstruct light. He described ground glass as consisting of a mass of prisms and reflecting surfaces, and suggested that since the glass was really clear, the light really got through after all, though it suffered somewhat from internal reflection. This is plausible enough in an *a priori* way, but the simple fact remains that a sheet of ground glass, or a frosted bulb, is found on the photometer to show an absorption of about 20 per cent. We have indeed found in one sample an absorption of only 16 or 17 per cent., but it frequently reaches 25 per cent. Now, the interesting and scientific part of the question would be to discover where the light does go. A plain sheet of glass obstructs 9 or 10 per cent. of the light, and the loss takes place in three different ways: firstly, and most important, the reflection at the first surface; secondly, the absorption in the glass through imperfect transparency; and lastly, internal reflection at the second surface. The first two are unaltered with glass ground on the second surface, but here the loss by internal reflection is much greater, for the angles of incidence are greater. Probably only one-half of the light passes directly through, losing nothing by mere refraction, but the other half gets tossed backwards and forwards by internal reflections, and not much more than a half of it gets through at all.

To make a measurement, the lamp must be wholly surrounded by ground glass. A flat screen will appear to absorb 30 per cent., because it diffuses the light in directions other than towards the photometer. Every photographer knows that there are very different qualities of ground glass, and that a very coarse or very fine grain each approximates to clear glass. A cut glass shade spun rapidly in front of a photometer will absorb about the same proportion as ground glass; no use-

ful measurement can be made when it is stationary, as a plane facet may happen to let light pass direct, or a prism may increase or reduce the illumination on the photometer screen. A very beautiful lamp was invented by Mr. L. J. Crossley, in which half the bulb was opal, and though the naked filament was visible, it largely reduced dazzling, since it was seen against a bright, not a dark background; but, for reasons connected with the lamp monopoly, it has not been placed on the market. Silk shades get dusty, and fancy glass looks tawdry by daylight, but anything is better than a naked 16 candle lamp, backed, perhaps, by some glaring copper or ormolu fitting.

The whole subject is one which we think might well be taken up by some architect. Members of this kindred profession have done great service by the design of original and convenient fittings, and useful mouldings and casings. Engineers will do all they can to make electric light safe and cheap; let some artistic genius make it comfortable and beautiful. Few statements are so detrimental to the progress of the industry as the half-truth—electric light is bad for the eyes.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

MR. W. H. FORD, Secretary of the Fremont (Ohio) Gas Company, has been authorized to make public the fact that on and after the 31st inst., the gross rate per 1,000 cubic feet will be put at $1.50, prompt payment—within 10 days from presentation of bills—to entitle consumer to a rebate of 25 cents per 1,000 cubic feet. Further, the Company has decided not to charge in future "a meter rent." This is cheap gas, surely; and while we congratulate the Company on that pleasant fact, we think its action in abating the meter rent charges is a still more striking example of its determination to popularize itself.

MR. BADGER, of the Light Committee of Councils, Montreal, Canada, has submitted the following estimate respecting the probable cost of public lighting in that city for the ensuing year: Electric lighting, $138,000; gas lamps, $18,800; total, $156,800. The total expenditure for last year was $141,250, and the increase is to provide for 50 additional arcs, some of which are to be located on streets newly opened, the balance to be put in situations "where at present there is too little illumination." The latter or quoted portion of the reasons seems rather strained, when it is remembered what strength was put into the original pledges that the scheme of arc lighting as arranged would be far more than equal to the thorough illumination of the districts to be covered.

OCEAN CITY, N. J., is to have a gas company, the fund for the construction and equipment of which is said to have been subscribed by certain Philadelphians. The Company is capitalized in $25,000.

FROM the first annual report of the Superintendent of the Danvers (Mass.) municipal electric lighting plant we learn that the "net cost" per arc per year was $45.59. The lights were operated until midnight of each night, "on which there was no moon." Whatever the "net" cost may have been, it would be interesting could we determine the "gross." In the Superintendent's way of putting it, no allowance was made for wear and tear, and of course no rental figures in the findings, as the city "already had a suitable building," etc. Yes; we see!

THE Councils Committee on City Property, Philadelphia, has reported favorably on the proposition to sell 7½ acres of ground, adjoining the site of the 26th Ward gas works, to the Atlantic Refining Company.

A CORRESPONDENT forwards the following (and we were more than sorry over receiving the news) from Davenport, Ia., under date of the 6th inst. "The retirement of Mr. J. B. Howard from the Superintendency of the Key City or Dubuque Gas Light Company is an event of importance. Mr. Howard took the position in 1860, as the successor of Mr. Graves, and it goes without saying that he has filled the situation admirably during his long term of service, giving general satisfaction both to the public and to his employers. Apart from his connection with the Gas Company, Mr. Howard served, with credit to himself and fidelity to the city, two terms as an Alderman, and was also one of the executive officers of the local Loan Association. Those who know the gentleman—and who in the gas business in the West does not know and like him?—may take it for granted that he would not resign from the Company's services, if, by remaining, he could further its interests in the spirit that always actuated his motives—a spirit of fairness and sincerity. The Company, on his resignation, adopted the following resolutions:

"'*Whereas*, Mr. J. B. Howard, who has been Superintendent of this Company since its organization, has tendered us his resignation, to take effect, May 1, 1891.

"'*Resolved*, That in accepting the resignation of Mr. Howard, we desire to express our recognition of his abilities in his profession. We regard him as a gas engineer of prime capability, and one who has always shown an active interest in the development of the industry with which he has been so long and so prominently identified; and, be it further

"'*Resolved*, That in withdrawing from the service of this Company Mr. Howard carries with him our sincere wishes for his future prosperity.

"'GEO. MCLEAN, Secretary. W. L. BRADLEY, President.'

"The resolutions speak nothing else than the truth, in respect to the first, at any rate, in so far as that refers to 'Uncle Jerry's' qualifications as a gas man. If the Company, however, failed to say anything savoring of regret at the termination of the relations between it and Mr. Howard, the engineers of the West will agree with me in making note of the omission. Perhaps they would have done just as well had they left unsaid what they did say, for it strikes me that Mr. Howard does not stand in need, so far as the fraternity of this section is concerned, of a certificate about his capacity as a gas engineer.—T. D. I."

THE Van Depoele Electric Light Company's plant at Natchez, Miss., is being dismantled. The loss to the shareholders is total and permanent.

RECEIVER JOHN B. FELDER has disposed, at public auction, of the plants and franchises of the Americus, Ga., Gas and Electric Light Company. The purchasers were representatives of the Baltimore bondholders, and the price paid was $61,100—or $1,100 in excess of the first mortgage. The purchasers will put the plant in shape for service at once.

AT the annual election of the Charleston (S. C.) Gas Light Company the following officers were chosen: Directors, Messrs. Thomas Turner, A. S. Johnston, W. B. Smith, J. C. Simmonds, John S. Riggs, George W. Williams, M. Israel, H. E. Young and G. L. Buist; President, Thomas Turner.

THE Milwaukee (Wis.) *Evening Wisconsin* says: "The fuel gas project of the Milwaukee Gas Light Company is proving a success. Over 600 subscribers have, since the reduction in the price of gas for fuel purposes went into effect on January 1, had extra meters put in, so that they can secure the fuel gas rate of 80 cents per 1,000 cubic feet. This number is rather larger than the Company expected to have at the end of two months, for there is comparatively little demand for gas for cooking purposes during the winter. When the warm season begins, the Company will undoubtedly be besieged with applications for extra meters. A fuel gas department has been opened in the East Water street office of the Company. One side of the room has been given up to the display of gas stoves. There is a specimen of every standard make in the country, and no favoritism is shown, the object being simply to demonstrate the advantages of gas for fuel purposes. The department is in charge of an expert who exhibits the stoves and shows their operation."

PRESIDENT MORRIS, of the Louisville (Ky.) Gas Company, says that the electric lighting station will be in readiness for operation on or before July 1st.

THE City Council of Cincinnati, has negatived the proposition to install and operate an electric lighting plant on municipal account.

THE authorities of Santa Cruz, Cal., have agreed to cease supplying commercial users of light from the municipal electric lighting plant.

THE proprietors of the Rockville (Conn.) Gas Light Company have petitioned the Legislature for the right to change the name of the corporation to the Rockville Gas and Electric Light Company.

FROM local sources we learn that the State Board of Gas and Electric Light Commissioners has granted permission to the Lawrence (Mass.) Gas Company to engage in the electric light business at Methuen, and has dismissed the petition of the Methuen Gas Company, a proposed separate corporation. It will be remembered that the Lawrence Gas Company some time ago petitioned the Methuen Selectmen for the right to light the town both by gas and electricity, and that a hearing was given on the petition, the principal remonstrant being the embryo Methuen Company. The Selectmen, however, granted the Lawrence Gas Company the right to distribute gas in the town, but withheld action on that portion of the petition relating to electricity because of some legal points, and the matter was then brought before the State Board, at public hearing held in Methuen some weeks ago. The Commissioners decide that, as the Methuen Gas Company holds no rights whatever in

Methuen, there is no legal objection to granting the petition of the Lawrence Gas Company. Mr. Humphreys is to be congratulated on the result of his patient course in this matter.

MR. JOHN A. SEELEY, the electrical expert retained by the Wheeling (W. Va.) City Electric Light Commission to make an estimate as to the probable cost of putting in an electric lighting plant up to the maintenance of 400 full power arcs, has submitted the following—expert Seeley, however, admits that the figures are subject to revision:

400 (2,000 candle) lamps, with dynamos, etc., set up	$40,000
150 poles, 50-foot, at $5	750
100 mast arms, at $12	1,200
Erecting arms on poles	50
Guy wire, 2 miles	100
Shafting, pulleys, foundations, etc., set up	4,000
Two 400 horse power engines, with boilers, set up, except foundations	16 000
Foundations for engines and boilers	2,000
70 miles of line, poles, etc., complete, set up	17,500
Freight	500
Building, 60 feet by 70 feet, by 18 feet	8,000
Total cost of material for and labor on plant	$90,000

It will be noticed that this estimate makes no provision for ground site, although Mr. Seeley does mention the fact that he examined a vacant piece of ground owned by the city on the south side of 19th street, just west of the largest gasholder of the city's gas works system, but believes it would not be judicious to build the electric works there. His objections were based on the ground that the plot was rather small, that the construction of foundations would be very expensive, and that it "would be running a risk to locate such a plant so close to such a large quantity of gas. A chance spark from the dynamos, or a flash of lightning running in on the wires might blow up the whole thing." What whole thing?

AN amusing suit is that reported last month, from New Orleans, La., where one Paul Louis Fourchy sues the New Orleans Gas Light Company for $500 damages, alleged to have been sustained through what he terms the illegal cutting-off of the gas supply at his law office, No. 3½ Carondelet street, and for a writ of mandamus compelling defendant to immediately recommence the supply of gas. The petitioner, among other things, states that he is ready and willing to pay the amount of his gas bill ($4.14) when called upon to do so, but denies the right of the defendant Company to compel him to *call* at its office for the purpose of making such payment. He charges that the cutting-off of the gas was done maliciously and in a spirit of petty annoyance to petitioner for an imaginary grievance, because petitioner had occasion quite recently, in the discharge of his professional duties, to compel compliance on defendant's part with the charter obligations of the Gas Company. It would be still more amusing if the Gas Company at a later day brought suit for libel against the complainant.

THE Directors of the New Bedford (Mass.) Gas Company have been authorized by the shareholders to bond that property in the sum of $150,000.

WE are indebted to a correspondent for the following: "At the annual meeting of the Memphis (Tenn.) Gas Light Company Messrs. Napoleon Hill, R. Dudley Frayser, John S. Bransford, N. M. Jones, T. K. Riddick, J. Nathan and John W. Bailey were elected Directors. The votes cast represented 5,716 shares, out of a total of 7,500, and there was no opposition to the ticket chosen. Three of the old Board (Messrs. Ensley, Williamson and Bruce) who retired were succeeded by Messrs. Riddick, Bailey and Nathan. Mr. Bailey is a son-in-law of Mr. Williamson, while Mr. Ensley retires because he is absent from the city a great deal, and has been identified with the Company for many years—from 25 to 35, or more. It is understood the policy of the Directors will be vigorous, that new mains will be laid, general improvement instituted, and a careful supervision over the business carried on. At present the Company is in excellent condition financially, owing no debts, except the bonds. Its works, too, are in capital order, and the only untoward feature is the fact that no dividends have been declared for more than two years past—competition with the Equitable Company is the cause. The result of this is that the stock has run down from $102 per share, which it stood at 12 years ago, to $35 per share, at which recent sales have been made. Some $200,000 of the Company's stock is owned by Nashville capitalists, and the bulk of this was represented at the meeting by Mr. John S. Bransford, who is one of the Directors. President N. M. Jones, in a recent circular to the shareholders, alluded to the condition of the Company, and its struggles with a rival company, as follows: 'Whilst we are paying no dividends we have never called upon you to put up a dollar to meet exigencies in the midst of this somewhat long conflict with a rival company, in which our output has been divided and our prices cut from $2,50 to $1.25 and $1.75 per 1,000 cubic feet. Many valuable improvements have been made at our works and in our streets and paid for. Our capital stock is $750,000; bonded debt, $240,000. We pay interest on these bonds, semi-annually, at the rate of 7 per cent. per annum, or $8,400 each time—total $16,800 per year. Our State, city and county taxes average, say, $15,000 per annum. These fixed charges, together with all current bills, expenses, improvements, etc., are promptly paid, and the Company is able to survive the shock of competition, and hopes in the future to extend its service to the community and yet prosper.'"

The authorities of Seattle (Wash.) have appointed a committee from the local governing bodies to establish a uniform schedule of gas rates for that city. Delegate Lansing, in supporting the proposition, argued that it was their bounden duty to fix gas rates, especially as it was plain that impositions were practiced by the Gas Company. Mr. Lansing, however, failed to set forth the nature of the impositions, resting content with the bare statement.

PRESIDENT DANGLER, of the Dangler Stove and Mfg. Company, of Cleveland, O., is greatly elated over the success that has attended the introduction of the Company's water-back gas range. Many large orders for it have been received.

ANOTHER peculiar damage suit is reported from St. Paul, Minn., where J. W. Gregg seeks to recover $5,000 damages from the St. Paul Gas Light Company, on account of an alleged assault committed on him by an employee of the Company on the 14th of February. Complainant asserts that the employee visited his store on the day in question and made ready to remove the gas meter. Gregg interposed an objection, whereupon, according to his version, the employee struck him on the head with a wrench. He further avers that the Company sustained the workman. The real truth in the matter is that Gregg attempted to forcibly restrain the workman from taking out the meter, and in the unpleasantness immediately following the storekeeper came out second-best.

IN view of the agitation at Richmond, Va., for a reduction in gas rates, the following statements from Mr. W. C. Adams, Superintendent of the gas works, will be interesting—the figures are from Mr. Adams' report for the year 1890:

"Having just completed my annual report for 1890, I thought it might be a matter of interest to you to know the net revenue from the works. The amount of gas consumed during the year was 173,343,500 cubic feet; 44,599,400 cubic feet of this amount was used by street lamps and public buildings. The Auditor reports the receipts and disbursements on account of the works as follows:

Received for gas	$196,329.39
" coke	20,176.21
" meter connections	2,087.03
Total receipts	$218,592.63
Disbursed for pay roll	81,448.54
" coal	60,058.93
" expenses	13,529.35
" extensions	11,903.49
" lamp lighting	3,301.25
	$170,241.56
Excess over expenditure	48,351.07
To which must be added 44,599,400 cubic feet of gas consumed by street lamps and public buildings, at $1.50 per 1,000	66,899.10
Total	$115,250.17
Less interest on plant, 6 per cent.	60,000.00
Balance in favor of works	$55,250.17

"I contend that neither lamp lighting nor extension properly belongs in this account. Extension is a permanent improvement and should be considered a part of the plant, and interest charged thereon. Lamp lighting has no business whatever to be charged to this department, as it is no part of our business to bear an expense that should come out of the general fund. Electric street lighting has just the same right to be charged to this department as the expense of lighting gas lamps has.

Not only the expense of lighting gas lamps is charged to this department, but all repair to lamps of every description, including lanterns, glass, burners, and cleaning lamps, is charged to the gas works. If these works were owned and run by a joint stock company, they would furnish gas at a certain price to each lamp, and the city would have to bear all other expenses. I merely mention this to show you that this department has very many expenses to bear that should not be counted in the cost for gas." Mr. Adams' presentation of the case makes it perfectly plain that the city authorities, instead of taxing gas consumers for the benefit of those who do not use it, should at once grant relief to the former class in the shape of an immediate and substantial reduction in the gas rate.

THE Athol (Mass.) Gas and Electric Light Company has been incorporated, with a capital of $25,000. Its officers are: President, G. C. Moses; Treasurer, F. R. Davis.

THE proprietors of the Dover (N. H.) Gas Light Company have applied for permission to amend their charter, to the end that the property may be leased for a term not to exceed 20 years.

ON and after April 1st the rate for gas at Bangor, Maine, is to rule at $1.80 per 1,000 cubic feet. Current rate, $1.98, net.

"OBSERVER" forwards the following, from Boston, Mass., under date of the 9th inst: "The members of the City Council, of Boston, at the invitation of Mr. J. E. Addicks, President of the Bay State Gas Company, made an interesting and instructive inspection, on Saturday, of the works of the Boston Gas Light Company, at the North End, and the more modern plant of the Bay State Company, at the Calf Pasture and Commercial Point, Dorchester. The only new feature seen at the North End works was the experiments being made in producing water gas, which, if satisfactory, will be supplied to consumers for heat and fuel. Valuable machinery and engineering skill are brought into requisition to reach the desired result. The process of the manufacture of water gas at the Bay State works was a novelty to nearly every member of the party. The attention of the party was directed to the efforts being made by the Company to prevent annoyance to the residents of Dorchester from offensive odors, and the members of the Board of Health who were present are satisfied that when the work now being done is completed the residents of that section of Boston will have no further ground for complaint."

THE Sioux Falls (Iowa) Company will overhaul its main pipes this spring.

THE Consumers Gas Company will lay a pipe line to the adjoining village of East Toronto, provided that, in addition to a certain number of public lamps, 40 persons will guarantee to use gas in their houses. Public lamps are to be furnished at a charge of $22.50 each per annum, and private consumers are to be supplied at the rates charged by the Company in Toronto proper.

Mr. Cornish has introduced into the New Jersey Legislature a bill appropriating a sum sufficient to place a gas plant in the State Industrial School for Girls.

A HINT from Lynn, Mass., is to the effect that a "standardizing bureau" has been formed among the different factories of the Thomson-Houston system. The members are Messrs. Dalzell, of the Schuyler Electric Company, Phipps, of the Brush Company, Talbot of the Fort Wayne Company, Randall, of the Excelsior Company, H. S. Manning, of the Chicago branch, Rohrey and Kostrom, of Lynn, and Lovejoy, of Boston. The object is to standardize all the apparatus supplied from the sources named.

THE bills offered in the lower branch of the Ohio Legislature, under which the authorities of Cuyahoga Falls and Guernsey, respectively, are empowered to borrow $15,000 for the installation of electric plants, to be operated on municipal account, have been sent on to the Senate.

THE Sing Sing (N. Y.) Gas Manufacturing Company offers to light the public gas lamps at the rate of $25 per lamp per annum. The Sing Sing Electric Lighting Company's proposition is to maintain any desired number of incandescent lamps (25 candle power) at $20 per annum each.

MESSRS. Lewis M. Rumsey, James Greene, George A. Madill and F. A. Baumgardner have applied for a certificate of incorporation of the Moberly (Mo.) Gas and Electric Company. The capital is returned at $30,000.

THE authorities of Allegheny City, Pa., complain that there is a wide difference between the estimates of the Westinghouse Company (which furnished the plant) and their Superintendent, as to the annual cost of operating the recently installed municipal electric lighting system. And the complaint seems to be well founded, as the Company's estimate was $21,585, while the Superintendent figures it at $45,000.

IT is likely that the property and franchises of the Wallingford (Conn.) Gas Light Company will soon pass from control of the present owners.

Something About Thermometers.

The aperture in the tube of a thermometer is smaller than the finest hair. And though it appears to be round, it is not, for if it were, the mercury could not be easily seen. It is, therefore, made flat, and then the glass magnifies it so that it seems to be quite large. To bring it out still more distinctly, a maker of Boston recently conceived the idea of backing the tube with a thin film of white sizing. This device is now generally adopted by the foreign makers.

Mercury is generally used in thermometers because it is more regular in its contraction and expansion. It is indeed impossible to make a spirit thermometer that will be as trustworthy as one in which mercury is used. In a mercurial thermometer the degree marks are all the same distance apart, because the expansion under all conditions is uniform. But in a spirit thermometer the degrees are wider apart at the top, because the expansion increases at a greater ratio after a certain temperature is reached. Though not so trustworthy, spirit thermometers are necesary, as mercury freezes at 40 degrees below zero. Spirits of wine is generally used, and is colored red, so that it will be more visible to the eye.

In a correct thermometer, the scale is graduated to the requirements of the tube to which it is fitted, so that every correct thermometer must have a special scale of its own. That is to say, it wouldn't do to put the tube of one thermometer in the frame of another. Of course, in the very cheap grades of thermometers such accurate adjustments are not made, and therefore their records are only approximately correct. The best thermometer tube made will cost about $5; but a thermometer may be made to cost almost any price, according to the way in which it is mounted.

As every one knows, the Fahrenheit scale is that most commonly used in this country. Fahrenheit arbitrarily assumed a limit of cold which he termed zero. This makes the freezing point 32 degrees above zero and the boiling point 212 degrees above zero. As a matter of fact, however, in northern latitudes the temperature in winter frequently falls below the zero point, so that there is no scientific reason why the zero point in the Fahrenheit scale should be where it is. A much more scientific scale is that known as the centigrade, which marks the point at which water freezes as zero, and divides the space between that and the point at which water boils into one hundred degrees. In the Reaumur scale zero marks the freezing point, and eighty above zero the boiling point. Many self-registering thermometers are now used. These instruments mark the highest or lowest temperature reached, as the case may be, so that one may return at night feeling assured that the weather can play no pranks without his learning of them.

The Market for Gas Securieties.

The city market for Consolidated gas is, if anything, weaker than at the time of our last report, although to-day (Friday) some evidence of an increase in quotations was presented. The bid price at noon was 96, or one-quarter point over that for a week ago. The tendency to hang at this quotation is mystifying, especially as the Company's output shows a substantial increase over that of a year ago. Other city shares are as before, unless it be noted that Mutual is inquired for, in small lots, with some persistency. Brooklyn shares are dull and strong, and Nassau easily takes the lead in respect to pride of place. From current gossip it would seem that, even at 135, Nassau offers a more than fair opportunity for a turn on the high side. Metropolitan is a shade off, but not because any stock has been offered at prices under those of a week ago. Chicago gas is strong at 43¼, and insiders predict that the 50 mark will be reached before May 1st. Laclede common is quoted at 15 to 18, and Bay State is also at better figures. The Company will soon have something to assert authoritatively in the matter of the practicability of its proposed fuel gas supply. The New Bedford (Mass.) Company will issue a bond shortly that is worthy the attention of investors, the stockholders having assented to the scheme proposed by the Directors. Under the influence of the change at Macon, Ga., shares in the Company have scored a marked advance.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 Wall St., New York City.

March 16.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	96	—
Central	500,000	50	—	85
" Scrip	220,000	—	95	100
Equitable	4,000,000	100	117	120
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	118	120
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Standard Gas Co—				
Common Stock	5,000,000	100	—	48
Preferred	5,000,000	100	—	90
Yonkers		50	112	—
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	117	120
Citizens	1,200,000	20	88	90
" S. F. Bonds	320,000	1000	100	103
Fulton Municipal	3,000,000	100	130	132
" Bonds	300,000		100	105
Peoples	1,000,000	10	91	92
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	100	105
" Bonds (5's)	70,000	—	—	—
Nassau	1,000,000	25	134	—
" Ctfs	700,000	1000	100	103
Williamsburgh	1,000,000	50	130	—
" Bonds	1,000,000	—	108	112
Out of Town Gas Companies.				
Boston United Gas Co.—				
1st Series S.F. Trust	7,000,000	1000	87½	88
2d " " "	3,000,000	1000	—	76
Bay State Gas Co.—				
Stock	5,000,000	50	—	57
Income Bonds	2,000,000	1000	95½	—
Buffalo Mutual, N. Y.	750,000	100	105	110
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
" " Bonds	45,000	—	—	—
Chicago Gas Company	25,000,000	100	43⅜	43½
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	100	84¾	85½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	98
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	100
2d "	2,500,000	1000	94	98½
Consumers Gas Light Co., Jersey City	2,000,000	100	12	15
Bonds	600,000	1000	70	75
Cincinnati G. & C. Co.	6,500,000	100	204	205
Consumers Toronto	1,000,000	50	190	200
Central, S. F., Cal			92	100
Capital, Sacramento, Cal			58	
Consolidated, Balt.	11,000,000	100	47¾	48
" Bonds	6,400,000		107	107½
Citizens Gas Lt. Co., Rochester, N. Y.	500,000	—	85	110
Bonds	250,000		—	—
East River Gas Co., Long Island City	1,000,000	100	100	105
Bonds	500,000	100	100	102
Hartford, Conn	750,000	25	102	108
Jersey City	750,000	20	165	170

Advertisers Index.

GAS ENGINEERS.

	Page
Jos. R. Thomas, New York City	385
Wm. Henry White, New York City	391
Fred. Bredel, N. Y. City	387

CHEMISTS.

Durand Woodman, New York City	375

GAS AND WATER PIPES.

Gloucester Iron Works, Phila., Pa	385
Mellert Foundry and Machine Co., Reading, Pa. (John Fox, Selling Agent, N. Y.)	385
Ohio Pipe Co., Columbus, Ohio	385
M. J. Drummond, New York City	385
R. D. Wood & Co., Phila., Pa	390
Warren Foundry & Machine Co., New York City	385
Donaldson Iron Co., Emaus, Pa	385
Dennis Long & Company, Louisville, Ky	385
Spiral Weld Tube Company, New York City	385
Gilbert & Barker Mfg. Co., New York City	376

PROCESSES.

National Gas Light and Fuel Co., Chicago, Ills	382
Bartlett, Hayward & Co., Baltimore, Md	389
United Gas Improvement Co., Phila., Pa	381
Burdett Loomis, Hartford, Conn	377
American Gas, Light and Heat Co., Phila., Pa	375

GAS WORKS APPARATUS AND CONSTRUCTION.

James R. Floyd & Sons, New York City	391
Continental Iron Works, Greenpoint, L. I	391
Delly & Fowler, Phila., Pa	391
Kerr Murray Mfg. Co., Fort Wayne, Ind	388
Stacey Mfg. Co., Cincinnati, Ohio	391
Bartlett, Hayward & Co., Baltimore, Md	389
Morris, Tasker & Co., Limited, Phila., Pa	389
Davis & Farnum Mfg. Co., Waltham, Mass	388
R. D. Wood & Co., Phila., Pa	390
Bouton Foundry Co., Chicago, Ills	391
Isbell-Porter Company, New York City	390
Fred. Bredel, N. Y. City	387
United Gas Improvement Co., Phila., Pa	381
National Gas Light and Fuel Co., Chicago, Ills	382
Berlin Iron Bridge Company, East Berlin, Conn	376

INCLINED RETORTS.

Laclede Fire Brick Manuf'g Co., St, Louis, Mo	339

GASHOLDER TANKS.

W. C. Whyte, New York City	382
J. P. Whittier, Brooklyn, N. Y	383

GASHOLDER PAINT.

The Government Waterproof Paint Co., Boston, Mass	376

RETORTS AND FIREBRICK.

J. H. Gautier & Co., Jersey City, N. J	386
B. Kreischer & Sons, New York City	386
Adam Weber, New York City	386
Laclede Fire Brick Manuf'g Co., St. Louis, Mo	386
Brooklyn Retort and Fire Brick Works, Brooklyn, N. Y	386
Borgner & O'Brien, Phila., Pa	386
James Gardner, Jr., Pittsburgh, Pa	386
Henry Maurer & Son, New York City	387
Chicago Retort and Fire Brick Co., Chicago, Ills	386
Baltimore Retort and Fire Brick Co., Baltimore	386
Oakhill Gas Retort and Fire Brick Co., St. Louis, Mo	386
Boston Fire Brick Works, Boston, Mass	386

SCRUBBERS AND CONDENSERS.

G. Shepard Page, New York City	341
R. D. Wood & Co., Phila., Pa	390
James R. Floyd & Sons, New York City	384

REGENERATIVE FURNACES.

Bartlett, Hayward & Co., Baltimore, Md	389
Fred. Bredel, New York City	387
Chicago Retort and Firebrick Co., Chicago, Ills	386
J. H. Gautier & Co., Jersey City, N. J	387
Adam Weber, New York City	378

GAS GOVERNORS.

Connelly Iron Sponge and Governor Co., New York City	383
Fred. Bredel, N. Y. City	387
Friedrich Lux, London, England	378
Wilbraham Bros., Phila., Pa	383

SELF-SEALING MOUTHPIECE DOORS.

Ibsell-Porter Company, New York City	390
Continental Iron Works, Brooklyn, N. Y	377

TAR AND CARBONIC ACID EXTRACTOR.

Geo. Shepard Page, N. Y. City	377

CEMENTS.

C. L. Gerould & Co., Brooklyn, N. Y	386

GAS ENRICHERS.

Standard Oil Co., Cleveland, Ohio	392

GAS METERS.

John J. Griffin & Co., Phila., Pa	394
American Meter Co., New York and Philadelphia	395
The Goodwin Gas Stove and Meter Co., Philadelphia, Pa	396
Helme & McIlhenny, Phila., Pa	395
D. McDonald & Co. Albany, N. Y	395
Nathaniel Tufts, Boston, Mass	394
Maryland Meter and Manufacturing Co., Baltimore, Md	394
Harris Bros. & Co., Philadelphia, Pa	394

EXHAUSTERS.

The P. H. & F. M. Roots Co., Connersville, Ind	380
Isbell-Porter Company, New York City	390
Wilbraham Bros., Philadelphia, Pa	383
Connelly Iron Sponge and Governor Co., New York City	383

GAS COALS.

Penn Gas Coal Co., Phila., Pa	393
Perkins & Co., New York City	392
Despard Coal Co., Baltimore, Md	393
Chesapeake and Ohio R. R. Coal Agency, N. Y. City	393
Westmoreland Coal Company, Phila., Pa	393
J. & W. Wood, New York City	392

CANNEL COALS.

Perkins & Co., New York City	392
J. & W. Wood, New York City	392

VALVES.

Ludlow Valve Manufacturing Co., Troy, N. Y	376
Chapman Valve Manufacturing Co., Boston, Mass	376
R. D. Wood & Co., Phila., Pa	390
The P. H. & F. M. Roots Co., Connersville, Ind	380
Gilbert & Barker Mfg. Co., New York City	376

GAS ENGINES.

Schleicher, Schumm & Co., Phila., Pa	360
Clerk Gas Engine Co, Phila., Pa	393

ENGINES AND BOILERS.

Jarvis Engineering Co., Boston, Mass	382

STEAM PUMPS.

Van Duzen & Tift, Cincinnati, Ohio	376

GAS LAMPS.

Fiske, Coleman & Company, Boston, Mass	380

PURIFIER SCREENS.

John Cabot, New York City	378

GAS STOVES.

American Meter Co., New York and Philadelphia	379
The Goodwin Gas Stove and Meter Co., Phila. Pa	396
George M. Clark & Company, Chicago, Ills	378
D. McDonald & Co., Albany, N. Y	395
Maryland Meter and Manufacturing Co., Baltimore, Md	394
Chicago Gas Stove Company, Chicago, Ills	378
Dangler Stove and Mfg. Co., Cleveland, O	375

STREET LAMPS.

J. G. Miner, Morrisania, New York City	376
Bartlett Street Lamp Man'fg Co., New York City	376

BURNERS.

C. A. Gefrorer, Phila., Pa	392
Moses G. Wilder, Phila., Pa	376

STEAM BLOWER FOR BURNING BREESE.

H. E. Parson, New York City	378

PURIFYING MATERIAL.

Connelly Iron Sponge and Governor Co., New York City	383
Friedrich Lux, London, England	378
Hill Chemical Company, Brooklyn, N. Y	383

COKE CRUSHER.

C. M. Keller, Columbus, Ind	393

ELECTRICAL APPARATUS.

Wm. Henry White, N. Y. City	391
Fort Wayne Electric Co., Fort Wayne, Ind	384

WANTED.

A well-known and experienced Gas Engineer desires

Position as Superintendent or Manager of Coal or Water Gas Works.

Thoroughly familiar with details of construction and enlargement of plants; 14 years' experience. Would purchase interest in small works. Best references. Address

822-tf "S. A. C.," care this Journal.

Coal Tar.

TENDERS will be received up to the 20th March, inst., by **The Montreal Gas Company,** for the whole or any portion of their make of Coal Tar, not exceeding 650,000 imperial gallons, for one year from the 1st of April next.

The Company will deliver the Tar at their works into tank cars or barrels to be supplied by the purchaser.

The Company will not bind itself to accept the highest or any tender.

Offers must be at so much per imperial gallon. For further particulars address

J. F. SCRIVER, Mangr. & Sec.

MONTREAL, CAN., 2d March, 1891. 822-2

POSITION DESIRED

As Superintendent of Gas Works,

By a young man fully experienced in the details of construction, manufacture, and distribution. Best of references. Address

814-tf "CONSTRUCTION," care this Journal.

WANTED,

Second-Hand Roots Exhauster, No. 3.

With Valves and 6-inch Connections, in good order. Address

817-13 "EXHAUSTER," care this Journal.

Proposals for Street Lighting.

SEALED BIDS will be received at this Office, up to 12 o'clock, April 2, 1891, for the furnishing, lighting, cleaning, repairing and keeping in repair **Seven Hundred Gasoline Street Lamps,** more or less, for a term of four years. Said lamps to be of latest design, frames to be painted, and when damaged in any way to be repaired at once; the glass to be kept clean and bright at all times. Lamps to be lighted at sunset and kept constantly burning until daylight every night in the year. The right is reserved to order the re-location of lamps from time to time, as the City Gas Inspector may direct. Bidders will be required to exhibit to the Gas Committee of the City Council, three days prior to the opening of bids, samples of lamps, posts and burners they propose to furnish. All bids must be accompanied by a certified check of $500, and the successful bidder will be required to give a bond in the sum of $5,000 for the faithful performance of the contract. The right is reserved to reject any or all bids.

C. S. GOODRICH,
OMAHA, NEBRASKA. City Comptroller.

FOR SALE,

One Air Condenser, 500,000 feet capacity.
One Multitubular Condenser, 500,000 feet capacity.
One Anderson Tar Extractor, 500,000 feet capacity.
Ten 12-inch Chapman Valves.
One Station Meter (Tufts'), 40,000 feet capacity.
Seventy-Five 12-inch by 20-inch Mouthpieces, with Balmore's Self-Sealing Lids.

All in good order. Address NEW HAVEN GAS LT. CO.,
819-tf New Haven, Conn.

DURAND WOODMAN, Ph.D.,

Analytic and Technical

CHEMIST.

Analyses of Gas, Fuel and Gas Coals, Crude and Refined Petroleum, Materials for Gas Purification, Tar, Ammoniacal Liquors and other Bye-Products, Fire Clays, Deposits in Mains, Water for Steam Making, Boiler Scale, etc., etc. Expert work in connection with "Damages to adjacent water supplies and adjoining properties." Experimental Investigations for Inventors

127 Pearl Street (Hanover Square), N. Y.

The American Gas, Light & Heat Co.,

OF

249 S. 6th St., Phila., Pa.,

Are now prepared to erect plants of their Oxy-Hydrocarbon Process, to carburet coal gas up to any given or named candle power required for general consumption (for instance, from 20 to 25 candles), and at a cost not to exceed one and three-quarters (1¾) cents per candle power per 1,000 cubic feet increased, with a permanent and perfectly *fixed* gas, *not a vapor*—a gas that will whiten the whole output of the works.

This gas can be furnished at a cost less per 1,000 cubic feet than the coal gas may be costing the company.

Our system is such that we can furnish plants that will carburet 50,000 cubic feet in 24 hours, or three or four million feet in the same length of time. *One* of our large benches or plants would be capable of generating 100,000 cubic feet of gas in 24 hours, which would raise the candle power on 2,000,000 feet (taking as a standard coal gas at 15 candles) 3 candles on the 2,000,000 feet, enabling the works to deliver to consumers an 18 candle gas; or, enlarging our plant, the candle power may be increased as desired, at the same cost per candle power, less interest on plant.

This is much less per candle power than it can be furnished by the use of cannel coal or by vaporizing naphtha. With our process we improve the whole output in color—viz., whiten the flame with the oxygen, as well as furnishing a *thoroughly fixed* gas, and no possible danger of separation as there is with vapor. Correspondence solicited.

J. J. NEWELL, Sec'y.

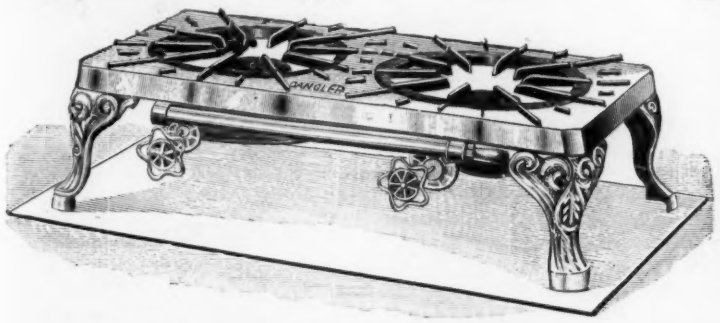
September 4, 1890.

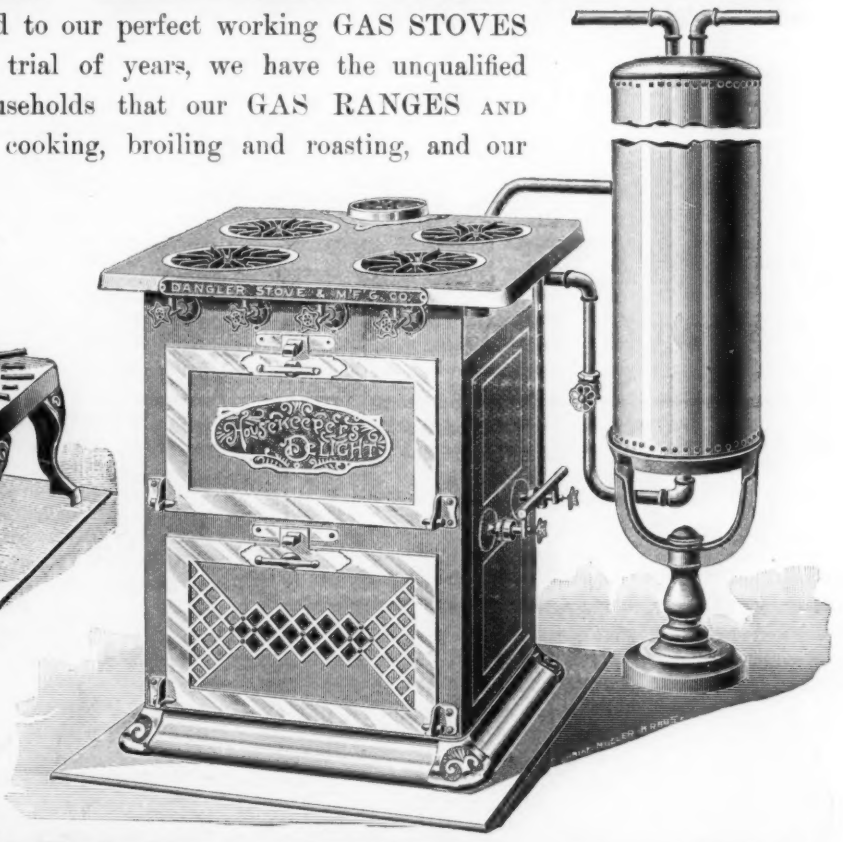
THE DANGLER GAS RANGES AND STOVES.

In calling the attention of those interested to our perfect working GAS STOVES AND RANGES, after a thorough and rigid trial of years, we have the unqualified assurance from the heads of over 6,000 households that our GAS RANGES AND STOVES are a perfect success for baking, cooking, broiling and roasting, and our

HOT WATER DEVICE

is a marvel of convenience and economy, furnishing an unfailing supply of hot water.





Our line includes all the different styles of Ranges and Stoves, and we call special attention to our

Hot Plates,

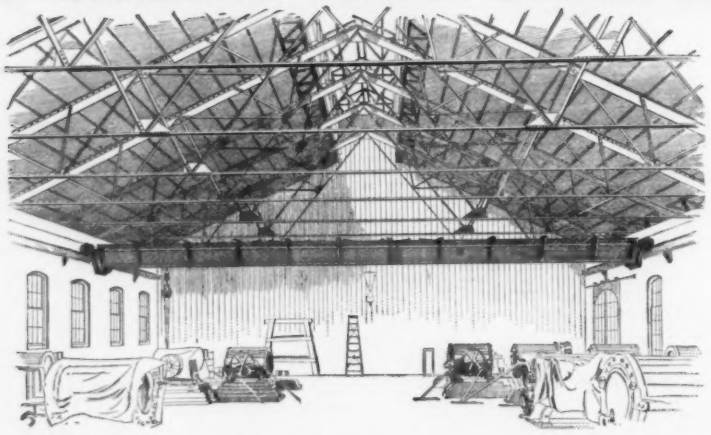
which are especially popular on account of the size and style, and finished either in nickel or polished iron.

We invite correspondence and send Catalogues on application.

THE DANGLER STOVE AND MANUFACTURING CO., Cleveland, O.

THE BERLIN IRON BRIDGE CO.

Write for Illustrated Catalogue.



Write for Illustrated Catalogue.

The above illustration is taken direct from a photograph of an iron truss roof built by us for the Narragansett Electric Light Company, at Providence, R. I. The roof is built entirely of iron, not a particle of woodwork being used about the construction of the building in any way; so that the danger from fire is entirely eliminated. The traveling crane shown in the illustration was also furnished by us, and is used to move the dynamos about the room. To Electric Light Companies who want a building which is indestructible by fire the above commends itself.

Office and Works, EAST BERLIN, CONN.

Agencies: WM. PAYSON, San Antonio, Tex. M. B. GRANT, Enterprise, Miss.
W. E. STEARNS, Omaha, Neb. A. M. RAWN, Dayton, Ohio.

GASHOLDER PAINT.

Use Only

THE GOVERNMENT WATERPROOF PAINT.

Proof against Ammonia, and Absolutely Waterproof. Send for Prices and Particulars.

THE GOVERNMENT WATERPROOF PAINT CO., 122 Milk Street, Boston, Mass.

The Miner Street Lamps,

Jacob G. Miner,

No. 823 Eagle Ave., New York, N. Y

Bartlett Street Lamp Mfg. Co.

MANUFACTURERS OF

Globe Lamps,

FOR

Streets, Parks, Public Buildings, Railroad Stations, etc.

LAMP POSTS

A Specialty.

Office and Salesroom,

40 & 42 COLLEGE PLACE, - - N. Y. CITY.

Gas Companies and others intending to erect Lamps and Posts will do well to communicate with us.

Fuel and Its Applications,

By E. J. MILLS, D.Sc. F.R.S., and F. J. ROWAN, C.E., assisted by others, including Mr. F. P. Dewey, of the Smithsonian Inst., Wash., D. C.

7 PLATES, AND 607 OTHER ILLUSTRATIONS. ROYAL OCTAVO, PAGES XX, 802. HANDSOME CLOTH, $7.50.

A. M. CALLENDER & CO., 42 Pine St., N. Y.

COMPLETE STEAM PUMP
10 SIZES FROM $7 TO $75
FOR WATER SUPPLY TANKS, FIRE PUMPS & ETC.
WRITE FOR PRICES AND DESCRIPTIVE CIRCULARS
VAN DUZEN & TIFT
SOLE MAKERS
CINCINNATI, O.

CHAPMAN VALVE MANUFACTURING CO.,

MANUFACTURERS OF

Valves and Gates for Gas, Ammonia, Water, Etc.

Also, Gate Fire Hydrants With and Without Independent Nozzle Valve. All Work Guaranteed.

WORKS & GEN'L OFFICE: Indian Orchard, Mass.

TREASURER'S OFFICE: 72 Kilby & 112 Milk Sts, Boston, Mass.

Gilbert & Barker Mfg. Co.,

90 John St., New York.

Pipe, Fittings, Valves

AND

SUPPLIES

Of all kinds for Gas, Steam, Water and Oil.

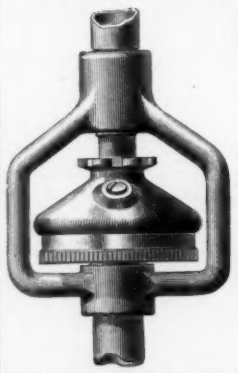
Illustrated Catalogue of 500 pages sent on application.

MOSES G. WILDER, MECH. ENGR.

816-18-20-22 Cherry St., Phila., Pa.

Volumetric Lamp Governors

FOR GAS LAMPS & HIGH-POWER BURNERS.



GOVERNOR BURNERS for STREET LAMPS AND GENERAL USE, and GOVERNORS FOR ARGAND AND OTHER COMMON GAS BURNERS IN ALL SIZES.

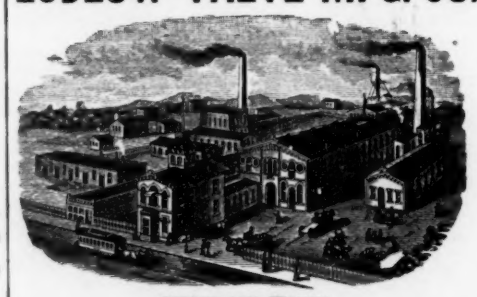
HORIZONTAL **Governors**

Specially adapted for GAS STOVES, FURNACES, Etc., Etc.

It is well known that a large majority of all High Power Gas Lamps in the United States have my Governors attached, and they are always used by the leading makers of these lamps. To remove any excuse for the use by anyone of inferior and infringing Governors, a reduction in price has been made, and all exclusive contracts are cancelled.

Correspondence Solicited with all who require a Reliable Governor.

LUDLOW VALVE MFG. CO.



OFFICE AND WORKS,
938 to 954 River Street and 67 to 83 Vail Av.,
TROY, N. Y.

Hydraulic Main Lip Regulators, also Check Valves, Foot Valves, Yard-wash and Fire Hydrants.

Send for Circulars.

Valves.—Double and Single Gate, ½ in. to 48 in., outside and inside Screws. Indicator, etc., for Gas, Water, Steam, and Oil.

Send for Circulars.

SELF-SEALING RETORT MOUTHPIECE AND LID.

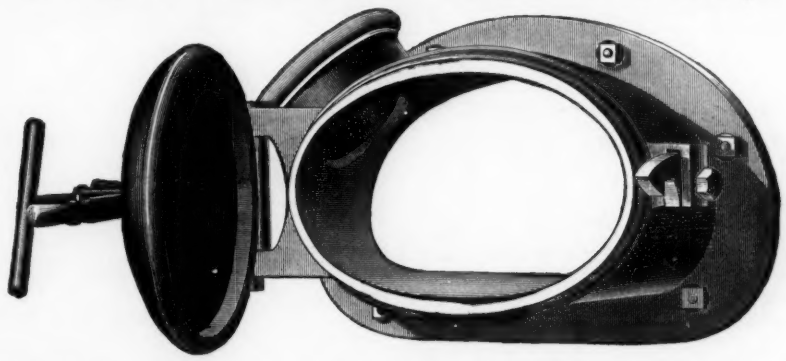
MANUFACTURED SOLELY BY

The Continental Iron Works

THOS. F. ROWLAND, President.

Take 10th or 23d Street Ferries from New York to Greenpoint. **BROOKLYN, N. Y.**

Made for Round, Oval, or "D" Retorts.



Joint made under the well-known Balmore Patent

This Mouthpiece and Lid was introduced to the public in 1884, and since then large numbers have been manufactured and sold.

The following important Gas Companies have them in use at the present time, to any of which we refer:

Charleston (S. C.) Gas Light Company.
Williamsburgh (Brooklyn, N. Y.) Gas Light Co.
Bridgeport (Conn.) Gas Light Company.
Buffalo Mutual Gas Light Company.
Palatka (Fla.) Gas Light Company.
Gainesville (Fla.) Gas Light Company.
Syracuse Gas Light Company.
Taunton (Mass.) Gas Light Company.
Providence Gas Light Company
Central (New York City) Gas Light Company.
Northern (New York City) Gas Light Company.
Stamford (Conn.) Gas Light Company.
Holyoke (Mass.) Gas Light Company.
Springfield (Mass.) Gas Light Company.

THE WALKER TAR AND CARBONIC ACID EXTRACTOR.

A very general demand exists, in both large and small Gas Works, for an apparatus that will be absolutely efficient in the removal of the Tar which passes the hydraulic main and condenser. Many attempts have been made to accomplish this, but, I believe, without success, until the introduction, six years ago, in England, of the C. & W. Walker Patent Tar and Carbonic Acid Extractor. During these years this apparatus has been adopted by many of the most prominent Engineers, not only in England, but also on the Continent of Europe and in other parts of the world. Several have been erected in the United States.

"The C. & W. Walker Tar and Carbonic Acid Extractor has been in operation at these works for the past six weeks, and is an unqualified success. It removes every particle of Tar from the gas in once passing through the apparatus, and a large percentage of the Carbonic Acid. I also feel quite sure that it prevents the formation and deposit of Naphthaline, because since I started the Washer I have had no stoppages from this cause. These works have been seriously troubled with Tar for many years, and I have used several kinds of apparatus and every expedient which has come to my attention for dealing with the difficulty, but without success. The Walker apparatus occupies comparatively small space, is less expensive than other systems, and requires but little attention. I carry 2½-inch seal, and have an automatic tar delivery valve. This Tar Extractor is indispensable to gas makers.

"C. A. GERDENIER, Supt. Bridgeport (Conn.) Gas Lt. Co."

This Tar Extractor will perform its work with about one-fourth the usual back-pressure heretofore required. It is simple in construction, and can be supplied at a very reasonable price—less than any other ever before introduced. Satisfactory results guaranteed in every instance.

GEO. SHEPARD PAGE, Sole Agt. for the U. S., 69 Wall Street, N. Y. City.

Water Gas! Fuel Gas!

For all Manufacturing Purposes. Generated from Bituminous Slack, Anthracite Coal Dust, or Coke Breeze, by

THE LOOMIS PROCESS.

Now in successful operation at Works of John Russell Cutlery Co., Turner's Falls, Mass., and Henry Disston's Sons' Saw Works, Tacony, Pa.

The Cheapest Gas Generating System in the World.

Utilizing any Kind of Low-Priced Coals.

NOVEL IN DESIGN, MODERN IN CONSTRUCTION, SIMPLE IN OPERATION, PERFECT IN RESULTS.

Plans and Estimates Furnished.

BURDETT LOOMIS, - - Hartford, Conn.,

Or Murray Hill Hotel, New York City.

MANHATTAN FIRE BRICK AND ENAMELED CLAY RETORT WORKS.

ADAM WEBER, Prop'r,

633 East Fifteenth St., N. Y.

Modern Recuperative Furnaces

FOR FIRING COAL GAS AND FIXING BENCHES, ALSO INCLINED AND VERTICAL RETORTS.

The most successful Furnace in America in competition with all others. Results equalled by no other Furnace, Full or Semi-Regenerative. Superior to all others in strength of construction and prolonged life of Retorts and Furnace.

Parson's Steam Blower,

FOR IMPROVING BAD DRAUGHT IN BOILERS, AND FOR BURNING BREEZE OR OTHER WASTE MATERIAL.

PARSON'S TAR BURNER.

FOR UTILIZING COAL TAR AS FUEL.

PARSON'S AIR JET TUBE CLEANER,

FOR CLEANING BOILER TUBES.

These devices are all first-class. They will be sent to any responsible party *for trial*. No sale unless satisfactory. Manufactured by the WATERTOWN STEAM BLOWER COMPANY.

H. E. PARSON, Supt., No. 54 Pine St., N. Y.

SPECIAL TRAYS FOR IRON SPONGE OR OXIDE OF IRON.

CHURCH'S TRAYS A SPECIALTY.

REVERSIBLE-STRONGEST-MOST DURABLE-MOST EASILY REPAIRED.

JOHN CABOT. TRAYS FOR GAS WORKS.

308-310 ELEVENTH AVENUE, NEW YORK.

WE ALSO MAKE THE CHEAPEST AND STRONGEST REVERSIBLE BOLTED TRAYS IN THE MARKET.

CHICAGO GAS STOVE CO.

MANUFACTURERS OF ALL KINDS OF

Gas Cooking and Heating APPLIANCES.

240, 242 & 244 West Lake St., Chicago.

Send for Catalogue.

FRIEDRICH LUX,

Ludwigshafen am Rhein and London.

Lux Mass'l

GAS GOVERNORS,

Gas Balance.

JEWEL GAS STOVES

MANUFACTURED BY

GEORGE M. CLARK & COMPANY,

157 & 159 Superior Street, - Chicago, Ill.

EVERY CONCEIVABLE SIZE AND STYLE.

Ranging in Prices from $1.50 to $37.00.

WE USE NO GAS COCKS.

All Flames are Regulated by a Direct Needle Valve.

The JEWEL

IS THE

Only Well-Made Gas Stove on the Market.

Write for our 1890 Catalogue and see for yourself.

Jewel Circulating Water Heater. $15.00.

GAS STOVES. GAS METERS. GAS STOVES.

THE AMERICAN METER CO.

Established 1834. Incorporated 1863.

MANUFACTURERS OF

Standard 3 Diaphragm Dry Meter.

Gas Meters,

STATION METERS,

METER PROVERS, PHOTOMETERS,

Experimental Meters of all Kinds,

AND

Standard 2 Diaphragm Dry Meter.

Apparatus for Testing the Quantity and Quality of Gases.

Meters for Measuring Natural Gas.

MANUFACTORIES,

508 to 514 West Twenty-second St., N. Y. Arch and Twenty-second St., Phila.

Nos. 244 & 246 North Wells Street, Chicago, Ill.

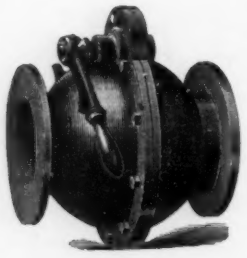
AGENCIES,

No. 177 Elm Street, Cincinnati, Ohio. No. 222 Sutter Street, San Francisco, Cal.

No. 810 North Second Street, St. Louis, Mo.

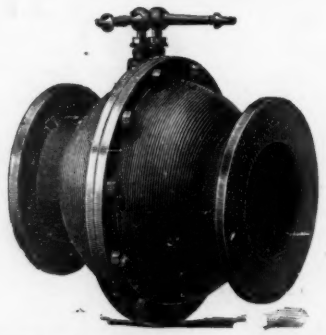
GAS STOVE SHOW ROOMS, No. 242 Sixth Avenue, New York City.

ROOTS'
GAS AND BYE-PASS VALVES.



GAS VALVE

Quick Acting,
Simple,
Efficient, Durable.

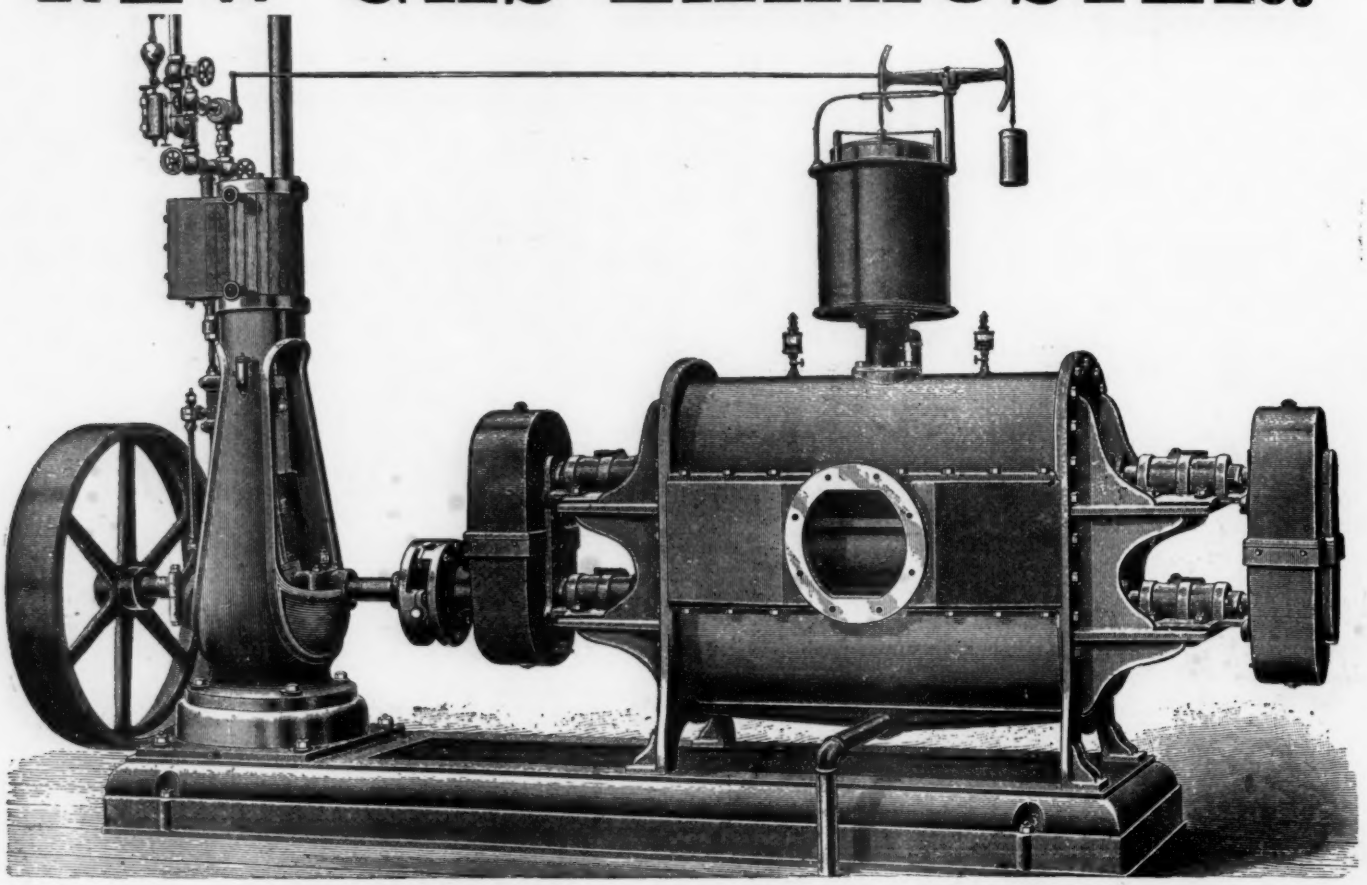


BYE-PASS VALVE.

Automatic Action
Reliable
Simple Durable.

Thousands now in use and giving perfect satisfaction. Write for Catalogue and Prices.

ROOTS'
NEW GAS EXHAUSTER.



Send for Descriptive Catalogue and Price List.

THE P. H. & F. M. ROOTS CO., Patentees and Manufacturers, **CONNERSVILLE, IND.**

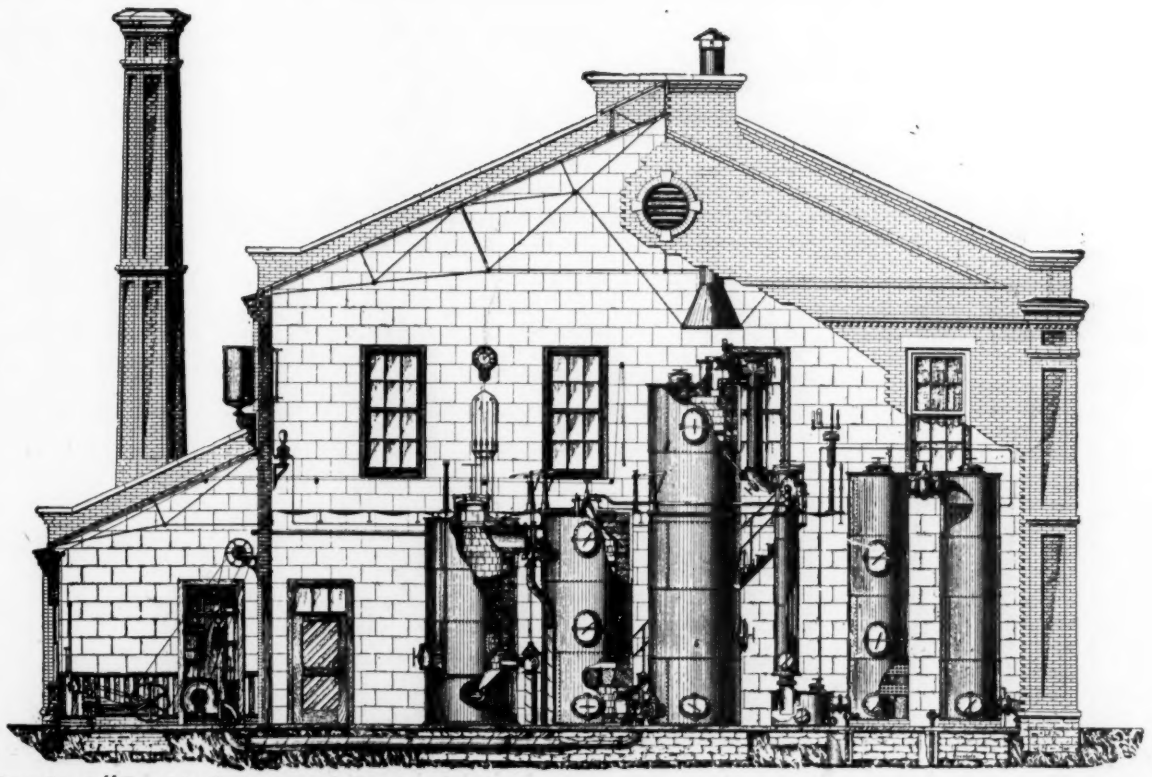
S. S. TOWNSEND, Gen. Agt., 22 Cortlandt St., N. Y. COOKE & CO., Selling Agts., 22 Cortlandt St., N. Y.

THE UNITED GAS IMPROVEMENT CO.,

DREXEL BUILDING, PHILA., PA.

Owners of the Lowe, Granger-Collins, McKay-Critchlow (for carbureting Natural Gas), and Other Gas Patents.

BUILDERS, LESSEES and PURCHASERS OF GAS WORKS.



Standard "Double Superheater" Lowe Apparatus, Especially Designed for the Use of Lima Crude Oil.

Erectors of

WATER GAS PLANTS,

(Either Independent or Auxiliary to Coal Gas Works),

USING LIMA OR OTHER LOW GRADE OILS AND ANTHRACITE COAL OR GAS HOUSE OR OVEN COKE.

PAMPHLETS, PLANS, AND ESTIMATES FURNISHED UPON APPLICATION.

NATIONAL GAS LIGHT AND FUEL CO.,

218 La Salle Street, Chicago.

C. D. HAUK, Prest. & Gen'l Manager. A. W. GREEN, Vice-Prest. N. A. McCLARY, Sec. & Treas. E. E. MORRELL, Engr.

GAS WORKS

Built, Remodeled, Leased, and Purchased.

71 Springer Cupolas have been installed in the U. S. during the past four years.

The total capacity of Springer Apparatus now in use is over 25,000,000 ft. daily.

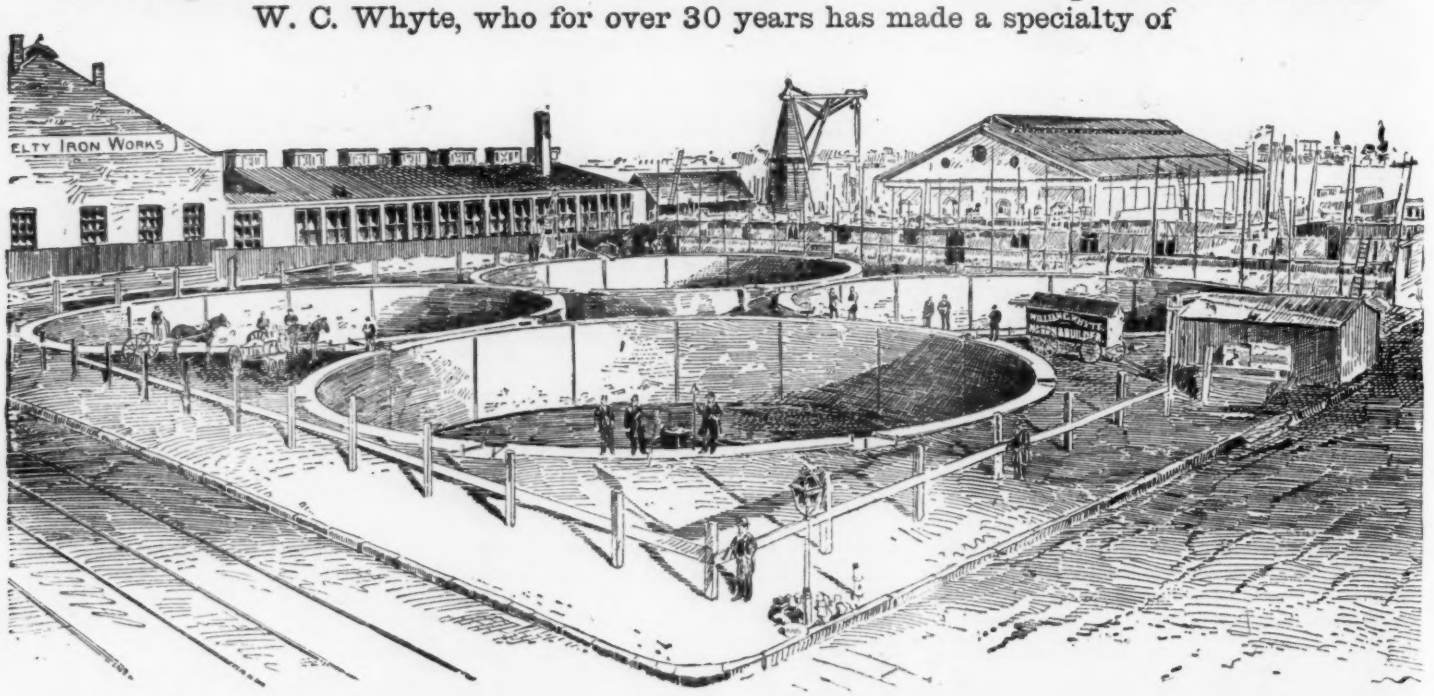
THE SPRINGER CUPOLA SYSTEM

Has Proven Itself the most Economical and Satisfactory Method of Gas Manufacture ever brought to the attention of the Gas Fraternity.

GUARANTEED ESTIMATES of Cost of Gas Furnished on Application.

GASHOLDER TANK CONSTRUCTION, ETC.

Gas Companies and others about to erect Gasholders will find it profitable to consult W. C. Whyte, who for over 30 years has made a specialty of



Tank Excavation and Mason Work.

Fifty Tanks now in operation show the sort of work done. Address

W. C. WHYTE, - No. 15 Cortlandt Street, N. Y. City.

CONNELLY IRON SPONGE AND GOVERNOR CO.,

(Successors to CONNELLY & CO.)

MANUFACTURERS OF GAS WORKS SPECIALTIES.

"IRON SPONGE." Saves money, saves labor, and is the most efficient purifying agent ever offered as a substitute for lime. Now used *in every State in the Union*, and purifying daily over *thirty-five million cubic feet.* Should be used in every gas works. Its own saving will pay for it many times over.

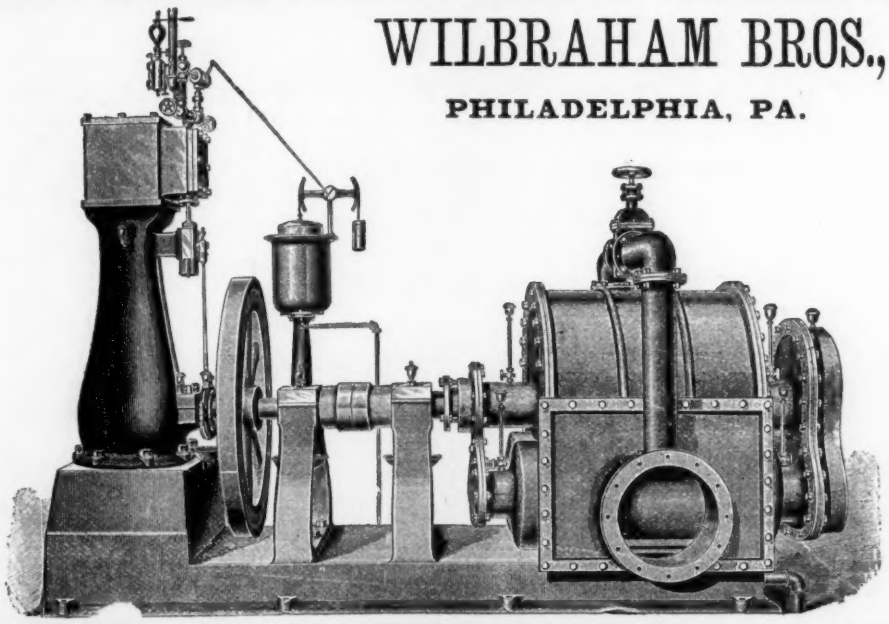
AUTOMATIC GOVERNOR. Has been on the market but *three years*, and in that time has been introduced *more generally* than any invention ever designed for use in gas works. Over *three hundred* of them now in use. Sensitive; reliable; perfectly automatic; reduces leakage; satisfies consumers, and gives great relief to the Manager. No gas works is *complete* without one of these machines.

STEAM JET EXHAUSTER. Designed particularly for small works Combines Exhaust Tube, Steam Governor Gas Compensator, and Bye-Pass Valves in the most compact form possible; occupies but little space; uses very little steam; operated by ordinary workmen; saves formation of carbon in retorts; increases yield 10 to 15 per cent. Specially adapted for *mixing air* with oil gas. *No works* too small to use them profitably.

Prices given on all our specialties *delivered at any point in the United States.* Correspondence solicited.

CONNELLY IRON SPONGE AND GOVERNOR CO., No. 111 Broadway, New York.

WILBRAHAM
GAS EXHAUSTER & ENGINE COMBINED.



WILBRAHAM BROS.,

PHILADELPHIA, PA.

"SUCCESSFULLY INTRODUCED."

Hill Chemical Company's

IRON MASS

For Gas Purification.

Office, 229 Bridge Street. Works, Newtown Creek.

BROOKLYN, N. Y.

CORRESPONDENCE SOLICITED.

JARVIS ENGINEERING CO.,

61 Oliver St., Boston, Mass.

CONTRACTORS FOR ERECTING

COMPLETE STEAM OUTFITS FOR ELECTRIC LIGHTING STATIONS.

Steel Boilers set with Jarvis Pat. Boiler Setting

To burn **COKE SCREENINGS** for Fuel.

ARMINGTON & SIMS CO. ENGINES,

Belting direct to Dynamos, without using Shafting.

SEND FOR CIRCULARS.

REFERENCES.—Charlestown Gas & Electric Light Co., Charlestown, Mass.; Schenectady Gas & Electric Light Co., Schenectady N. Y.; Brookline Gas Co., Brookline, Mass.

Gasholder Tanks & Gas Works Masonry Complete.

PLANS PREPARED AND ESTIMATES FURNISHED AT SHORT NOTICE.

J. P. WHITTIER, 70 Rush St., near Division Av., Brooklyn, N. Y.

A Large Quantity of Ground Fire Brick For Sale Cheap.

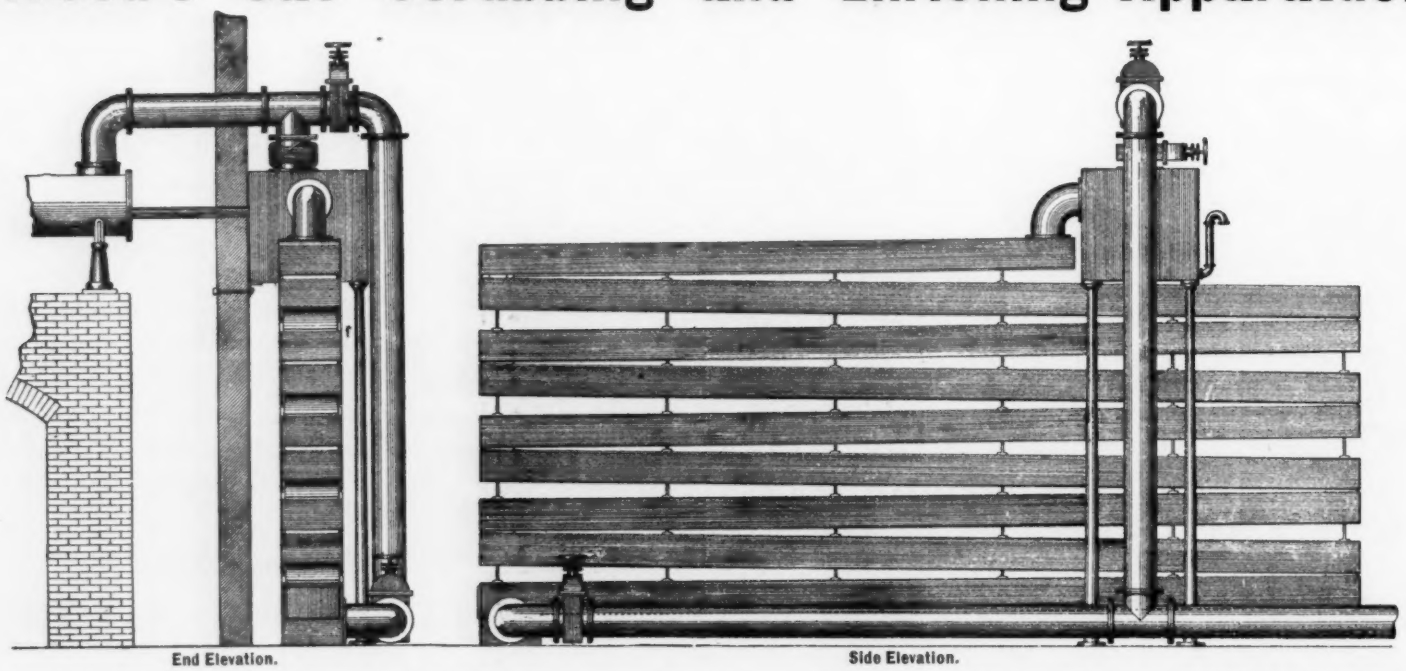
1890 DIRECTORY 1890

OF THE GAS LIGHT COMPANIES of the UNITED STATES & CANADA

Price, - - - - - - - $5.00.

A. M. CALLENDER & CO., No. 42 Pine Street, N. Y. City.

Wood's Gas Scrubbing and Enriching Apparatus.



End Elevation. Side Elevation.

The cheapest, simplest, and most effective apparatus for removing Tar and Ammonia, and enriching Gas, ever brought to the attention of Gas Manufacturers. With ordinary condensers and scrubbers the condensable illuminants flow off to the tar wells and liquor tanks and are lost, but with Wood's Apparatus these illuminants are saved and retained in the gas, thus increasing its illuminating power and making a great saving in the cost of enriching material. Where set up next after the Hydraulic main, this Scrubber produces an 8-oz. Ammoniacal Liquor.

JAMES R. FLOYD & SONS, - - Nos. 531 to 543 West 20th Street, N. Y. City.

FORT WAYNE ELECTRIC CO.

FORT WAYNE, IND.

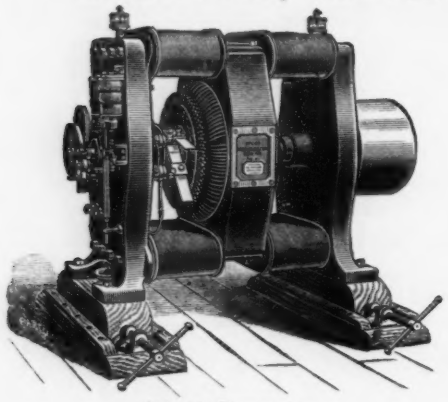
MANUFACTURERS OF THE

Slattery Induction System

—OF—

LONG DISTANCE INCANDESCENT LIGHTING.

The Most Carefully Worked Out and Complete Alternating Current System of Electric Lighting in Existence.



Wood Dynamo.

—AND THE—

WOOD

Automatically Regulating

ARC DYNAMOS and LAMPS.

Main Office, - - - Fort Wayne, Indiana.

Factories: Fort Wayne, Ind.; Brooklyn, N. Y.

BRANCH OFFICES.

NEW YORK, - - - - - - 115 Broadway.	DETROIT, MICH., - - - 57 Gratiot Avenue.
PHILADELPHIA, - - - - - 907 Filbert Street.	TORONTO, CANADA, - - 138 King Street, West.
CHICAGO, - - - 185 Dearborn Street.	MEXICO, F. Adams' Successors, - - City of Mexico.
SAN FRANCISCO, - - 35 New Montgomery Street.	CUBA, Maicas & Co., - - - - - Havana.

ENGINEERS.

P. D. WANNER, Chairman. A. H. MELLERT, Mangr. of Wks.
R. B. KINSEY, Secretary. F. A. KNOPP, Treasurer.

MELLERT FOUNDRY & MACHINE CO. Ltd. and READING FOUNDRY CO., Ltd.

Reading, Pa.

Specials—Flange Pipe, Valves and Hydrants Lamp Posts, Retorts, etc.

General Foundry and Machine Work.

JOHN FOX, Selling Agent. **160 Broadway, N.Y.**

THE OHIO PIPE COMPANY,

MANUFACTURERS OF

Cast Iron Gas & Water Pipe,

BRANCH AND SPECIAL CASTINGS.

Gas-House Bench Castings, Hydraulics, Lamp Posts, Flange Pipe and Specials, Architectural Castings, Building Columns, Joists, Cellar Grates, Sash Weights, etc.

GENERAL FOUNDERS AND MACHINISTS.

Columbus, Ohio.

M. J. DRUMMOND,

SPECIAL CASTINGS AND LAMP POSTS.

Office, Corbin Building, 192 Broadway, N. Y.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

JOS. R. THOMAS,

No. 42 Pine Street, N.Y. City.

CONSULTING AND CONSTRUCTING

Gas Engineer and Contractor.

PLANS, SPECIFICATIONS, AND ESTIMATES FURNISHED.

Contracts taken for all Appliances required at a Gas Works,

Either for New Works or Extensions to Old Plants.

GAS AND WATER PIPES.

SAM'L R. SHIPLEY, Pres. JAS. P. MICHELLON, Sec.
HENRY B. CHEW, Tr WM. SEXTON, Supt.

GLOUCESTER IRON WORKS,

GLOUCESTER CITY, N. J.

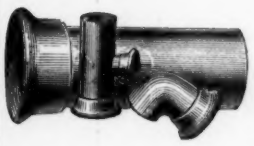
Cast Iron Gas & Water Pipes, Stop Valves, Fire Hydrants, Gasholders, &c.

Office, Rooms 703 & 704, Provident Bldg., 401 Chestnut St., Phila., Pa.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

DENNIS LONG & COMPANY,

LOUISVILLE, KY.,

Manufacture Exclusively

CAST IRON GAS & WATER PIPE & SPECIAL CASTINGS

OF ALL SIZES.

SPIRAL WELD STEEL PRESSURE TUBES.

HAMMER WELDED.

Best Gas Pipe Made

Strong, Light, Cheap

Flanges, Hubs & Spigots to the Regular Standards. Couplings for all Uses.

THE SPIRAL WELD TUBE COMPANY, - 43 JOHN STREET, N. Y.

King's Treatise on Coal Gas.

In 3 Vols. Price per Vol., $10. Sold either by Volume or in Sets.

A. M. CALLLENDER & CO., 42 Pine St., N. Y.

RETORTS AND FIRE BRICK.

J. H. GAUTIER & CO.,

CORNER OF

GREENE AND ESSEX STREETS,

JERSEY CITY, N. J.

MANUFACTURERS OF

Clay Gas Retorts,

Gas House Tiles,

Fire Bricks, Etc. Etc.

Ground Clay, Fire Brick and Fire Sand in Barrels,

J. H. GAUTIER. C. E. GREGORY. C. E. GAUTIER.

BROOKLYN

Clay Retort & Fire Brick Works,

(EDWARD D. WHITE & CO.)

Manufacturers of Clay Retorts, Fire Brick, Gas House and other Tile.

VAN DYKE, ELIZABETH, RICHARDS & PARTITION STS.

Office, 88 Van Dyke St., Brooklyn, N. Y.

RETORTS AND FIRE BRICK.

LACLEDE FIRE BRICK MFG. CO.,

MANUFACTURERS OF

Fire Brick, Gas Retorts,

AND

ST. LOUIS STANDARD SEWER PIPE.

Blast Furnace and Cupola Linings, every description of Fire Clay Material, Fire Clay Flue Linings, Chimney Tops Dry Milled and Crude Fire Clays, etc.

OFFICE AND DEPOT

901, 903, and 905 Pine Street,

ST. LOUIS, MO.

ESTABLISHED IN 1845.

B. KREISCHER & SONS,

OFFICE FOOT OF HOUSTON ST., E.R., N.Y.

Gas Retorts,

TILES, FIRE BRICK.

AND EVERYTHING IN THE FIRE CLAY LINE.

RETORTS AND FIRE BRICK.

MANHATTAN

FIRE BRICK & ENAMELLED CLAY

RETORT WORKS

ADAM WEBER.

CLAY GAS RETORTS AND RETORT SETTINGS

FIRE BRICKS, TILES, ETC.,

Office and Works, 15th Street and Avenue C., N. Y

BORGNER & O'BRIEN 23d ST. ABOVE RACE PHILADA. PA. U.S.A.

FIRE BRICK AND CLAY RETORTS.

Works, LOCKPORT STATION, PA.

—ESTABLISHED 1864.—

JAMES GARDNER, JR.,

Successor to WILLIAM GARDNER & SON.

Office, Rooms 19 & 20, Lewis Block PITTSBURGH, PA. P. O. Box 373

Fire Clay Goods for Gas Works.

SOLE REPRESENTATIVE OF THE McILHENNY REGENERATIVE BENCHES FOR THE U. S.

H. A. NORTON, No. 92 WATER STREET, BOSTON, MASS., Agent for the New England States.

GEO. C. HICKS, Prest. **CHICAGO** CHAS. A. REED, Sec. & Treas.

Retort and Fire Brick Co.,

MANUFACTURERS OF

Fire Clay Goods of all Kinds,

AND BEST QUALITY ONLY.

Regenerative Furnaces & Water Gas Goods.

45th St., Clark to La Salle, Chicago.

GEROULD'S IMPROVED RETORT CEMENT.

A Cement for patching retorts, putting on mouthpieces, and making up all bench-work joints. This Cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick. For recommendations and price list address

C. L. GEROULD & CO.,

5 & 7 Skillman St., Brooklyn, N. Y.

Western Agent, H. T. GEROULD, Mendota, Ill.

Parker-Russell Mining and Mfg. Co.,

CITY OFFICE,

Mermod-Jaccard Bldg., Rooms 307 & 308, Broadway & Locust St., St. Louis. Mo.

PROPRIETORS OF THE

OAKHILL GAS RETORT & FIRE BRICK W'KS

Our immense establishment is now employed almost entirely in the manufacture of

Materials for Gas Companies

We have studied and perfected three important points. Our retorts are made to stand changes of temperature, the strongest heats of the furnace, and the abrasion of feeding and emptying. We have the *exclusive Agency for the West* of the celebrated

Kloenne-Bredel Full Depth and Semi-Recuperator Benches,

And also furnish and build

Our Own Styles Semi-Recuperator Furnaces for the use of Coal or Coke as fuel.

THOS. SMITH, Prest. AUGUST LAMBLA, Vice-Prest. & Supt.

BALTIMORE

RETORT & FIRE BRICK CO.

MANUFACTORY AT

LOCUST POINT BALTIMORE, MD.

Clay Retorts, Blocks & Tiles

FIRE BRICK, FIRE CLAY,

AND FIRE CEMENT.

Red and Buff Ornamental Tiles and Chimney Tops. Drain and Sewer Pipe (from 2 to 30 inches). Baker Oven Tiles 12x12x2 and 10x10x2.

WALDO BROS., 88 WATER ST., BOSTON, MASS

Sole Agents the New England States.

Boston Fire Brick Works Manufacturers of **Gas Retorts and Settings**

Under the Personal Supervision of MR. GEO. C. HICKS late of Chicago.

Fire Clay Goods of all kinds. Akron Sewer Pipe, Lime, Cement, etc. Agts. for the Arc Gas Lamp & Governing Gas Burners.

Send for Circulars and Prices to

FISKE, COLEMAN & CO., Managers, No. 62 Congress Street, Boston, Mass.

FRED. BREDEL, C. E.,

Contractor for the Complete Erection and Equipment of Gas Works.

Sole Proprietor of the KLOENNE PATENTS for North America.

Gas Condensing and Purifying Machine.

Doing all the Work Between Exhauster & Oxide Purifier.

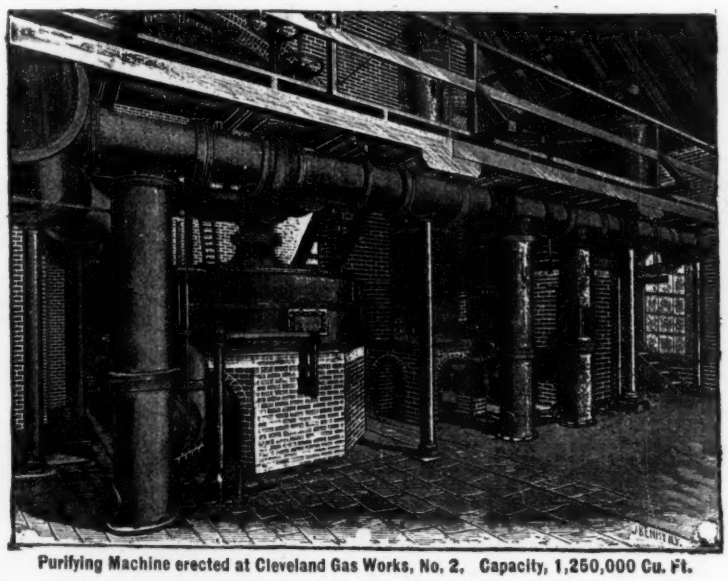
No Condensers Required.

No Naphthaline or Pitch is Formed.

HIGHER CANDLE POWER.

Tar & Ammonia Washers

WATER GAS WASHERS.



Purifying Machine erected at Cleveland Gas Works, No. 2. Capacity, 1,250,000 Cu. Ft.

RECUPERATIVE FURNACES.

Adapted to Retort Houses With or Without Stage Level.

Over 1,400 Retorts Now in Use in America.

Inclined Retort Benches.

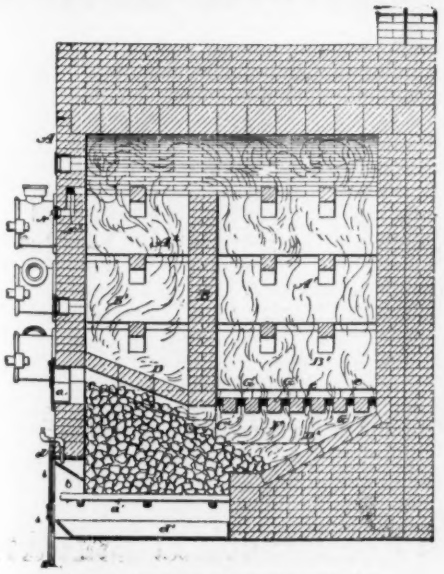
Refers, by permission, to Mr. Eugene Vanderpool, Newark, N. J., and Mr. E. G. Cowdery, Milwaukee, Wis.
For further information address

FRED. BREDEL,

No. 208 East Seventeenth Street, - - - - New York City.

FLEMMING'S

Generator-Gas Furnace



Materials furnished and Benches erected by

J. H. GAUTIER & CO., - Jersey City, N. J.

Address as above, or D. D. FLEMMING, Jersey City, N. J.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

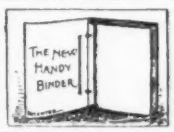
WORKS, Perth Amboy, N. J.

OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.



THE NEW HANDY BINDER.

This article may be described as elegant in appearance, strong, durable, and possessing many special qualities of its own. It allows the opening of the pages perfectly flat, whether one or several numbers are in the binder Any number can be taken out and replaced without disturbing he others. The papers are not mutilated for subsequent binding in permanent form. The binder is supplied with gilt side title, and is an ornament to any desk or reading table. The JOURNAL, filed in the Handy Binder, becomes a volume of great alue, always convenient for instant reference. **Handy Binder, Postage paid, $1 00.**

A. M. CALLENDER & CO., 42 PINE STREET, NEW YORK CITY.

The American Gas Engineer and Superintendent's Handbook.

By WILLIAM MOONEY.

Consisting of Rules, Reference Tables, and Original Matter Pertaining to the Manufacture, Manipulation, and Distribution of Illuminating Gas.

350 Pages, Full Gilt Morocco. Price, $3.

A. M. CALLENDER & CO., 42 Pine St., N. Y.

NEWBIGGING'S HANDBOOK FOR GAS ENGINEERS AND MANAGERS.

The present (the fifth) edition marks an important advance on those that have gone before. Considerable additions have been made to the text, and much of it has been rewritten and otherwise improved. Price, cloth, $6.

A. M. CALLENDER & CO., 42 Pine St. N. Y.

DAVIS & FARNUM MFG. CO.,

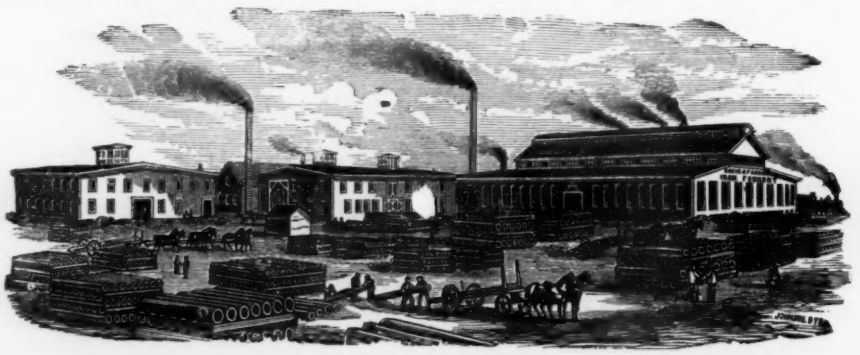
WALTHAM, MASS.

PRINCIPAL OFFICE AND WORKS, Waltham, Mass. BOSTON OFFICE, Room 18, Vulcan Building, 8 Oliver Street.

SINGLE, DOUBLE, AND TRIPLE LIFT

Gasholders.

OF ANY CAPACITY.



TUBULAR, PIPE, AND SINUOUS FRICTION

Condensers.

OF ALL SIZES.

IRON ROOF FRAMES AND FLOORS.

Purifying Boxes, Center Seal or Valve Connections, Bench Work.

Reversible Lime Trays.

SELF-SEALING AND PRESSED STEEL MOUTHPIECE LIDS.

Coke Barrows, Coal Wagons, and all Apparatus Requisite for a Complete Gas Plant.

— ALSO —

Gas and Water Pipe, Flanged Pipe,

Sugar House Work, and Special Castings of all Descriptions.

Established 1861. Incorporated 1881.

KERR MURRAY MFG. CO.,

FORT WAYNE, IND.

Those who are in need of

Holders or Gas Works Apparatus of any Description,

AND OF THE LATEST IMPROVEMENTS,

will find it to their interest to

GET AN ESTIMATE FROM US

before placing their order.

As we make a Specialty of this Class of Work, and are Practical Builders and Manufacturers of same,

with our long years of experience in the business,

WE CAN GUARANTEE YOU SATISFACTION.

Estimates, Plans and Specifications Furnished on Application.

BARTLETT, HAYWARD & CO.

Baltimore, Md.

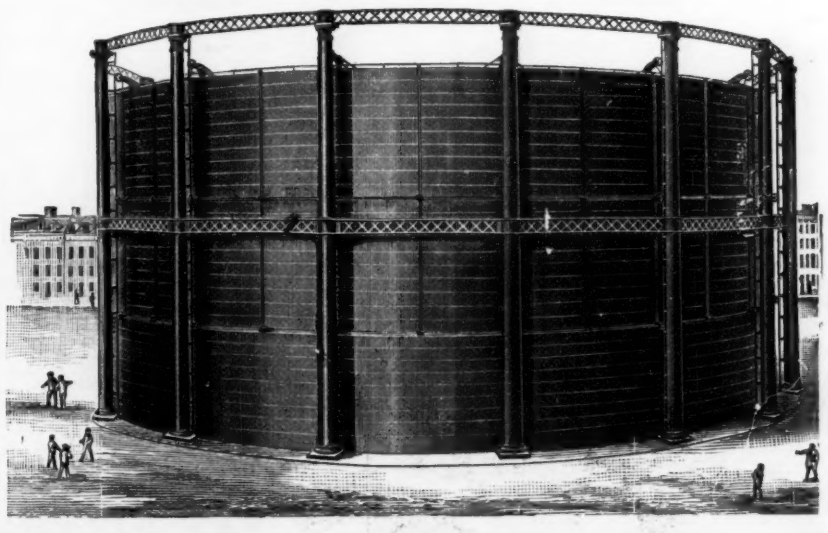
Triple Double, & Single-Lift
GASHOLDERS.

Iron Holder Tanks.

ROOF FRAMES.

Girders.

BEAMS.



PURIFIERS.

CONDENSERS.

Scrubbers.

BENCH CASTINGS.

OIL STORAGE TANKS.

Boilers.

The Wilkinson Water Gas Process.

THIRTY-CANDLE, NON-CONDENSABLE, FIXED GAS. THE MOST SUCCESSFUL GAS PROCESS IN OPERATION.

Munich Regenerative Furnace, System Drs. Schilling & Bunte.

MILL'S REVERSIBEL LIME TRAYS.

Gas Works Designed and Constructed.

Pascal Iron Works. ESTABLISHED —1821.— Delaware Iron Works.

MORRIS, TASKER & CO.,

INCORPORATED.

OFFICE, 224 SOUTH THIRD STREET, - - PHILADELPHIA, PA.

CONTRACTORS, BUILDERS, AND MANUFACTURERS OF

Gas, Water & Sugar Works

Bench Castings.

Condensers.

Scrubbers.

Purifiers.

Hyd. Carriages.

Iron Floors,

Iron Roofs.

Street Stops,

Valves, etc.

Stand-Pipes.

Water & Oil

Tanks, all Sizes.

Single, Double, and Triple-Lift Gas Holders.

SELF-SEALING RETORT LIDS. STAMPED STEEL RETORT LIDS.

Locomotive Water Columns, Filters, etc. Boiler Tubes, Wrought Iron Pipe & Fittings

Plans, Specifications and Estimates for all kinds of Machinery furnished on application.

Foundries & Works, MILLVILLE, FLORENCE, and CAMDEN, N. J.

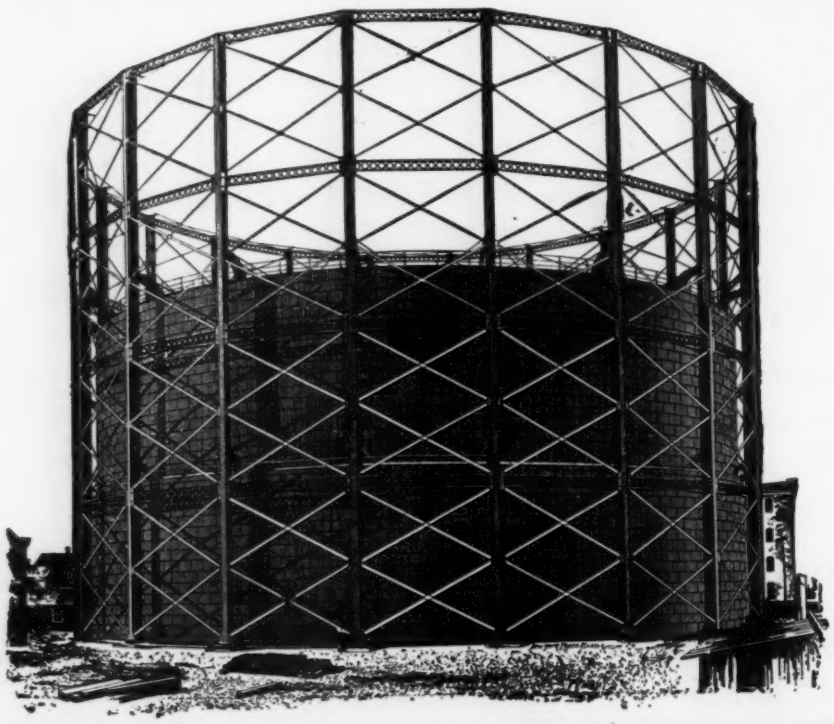
R. D. WOOD & CO.,

Engineers, Iron Founders, and Machinists.

400 Chestnut St., PHILADELPHIA, PA.

MANUFACTURERS OF

CAST IRON PIPE,



Gas Holders,

SINGLE, DOUBLE, AND TRIPLE LIFTS, WITH OR WITHOUT WROUGHT IRON OR STEEL TANKS.

PURIFIERS, CONDENSERS.

Scrubbers.

BENCH WORK.

Iron Floors and Roofs, Plate Girders.

Heavy Loam Castings.

HYDRAULIC WORK.

Lamp Posts, Valves, Etc.

ISBELL-PORTER COMPANY,

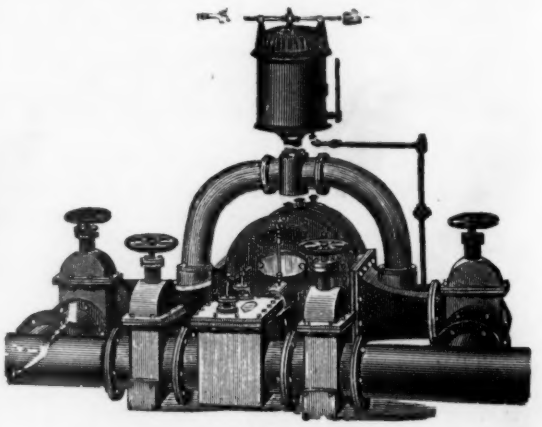
(Successors to SMITH & SAYRE MFG. COMPANY)

G. G. PORTER, Prest. *245 Broadway, N. Y.* CHAS. W. ISBELL, Sec'y.

Machinery & Apparatus for Gas Works

Drawings, Plans, and Estimates Furnished for the Improvement, Extension, or Alteration of Gas Works, or for the Construction of New Works.

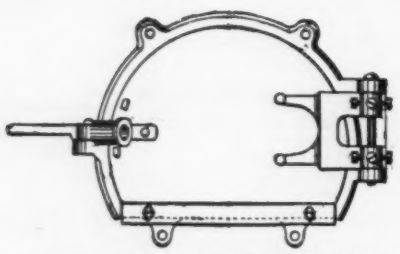
Mackenzie's Patent Rotary and Steam Jet Gas Exhausters, Governors, Compensators, Condensers, Washers, Scrubbers. Isbell's Patent Automatic Street Pressure Governor, Gas and Water Valves, Hydraulic Main Dip Regulator, Bench Castings, etc. Purifying Boxes and "Standard" Scrubbers Isbell's Patent Self-Sealing] Retort Doors



THE BRENNER SELF-SEALING RETORT DOOR.

Simple, Strong, and Durable.

CLOSES ABSOLUTELY TIGHT & IS LOCKED BY A CAM LEVER. ALL NECESSARY ADJUSTMENT FOR WEAR PROVIDED.



Brenner Self-Sealing Retort Door.

BUILT BY

ISBELL-PORTER COMPANY,

(Successors to Smith & Sayre Mfg. Co.)

No. 245 Broadway, - - - - New York City.

WILLIAM B. LUNDIE, Superintendent of the 42d Street Station of the Consolidated Gas Company, of New York, writes, under date of Jan. 4, 1889:

"We have 320 Brenner Self-Sealing Lids in use at this Station, built by the Smith & Sayre Mfg. Co. They require very little attention, and are the best of the kind that I have seen, giving entire satisfaction."

GAS WORKS APPARATUS AND CONSTRUCTION. GAS WORKS APPARATUS AND CONSTRUCTION.

JAMES R. FLOYD & SONS,

(SUCCESSORS TO HERRING & FLOYD)

Oregon Iron Works,

W. 20th & 21st. Sts., bet. 10th & 11th Avs.,

NEW YORK CITY.

Engineers and Contractors

FOR THE

CONSTRUCTION OF GAS WORKS.

MANUFACTURERS OF

All Kinds of Castings and General Ironwork

FOR

GAS APPARATUS.

Bench Castings, Regenerative and Half Regenerative Furnace Castings.

Condensers, Scrubbers, Purifiers, Street Drips and Connections,

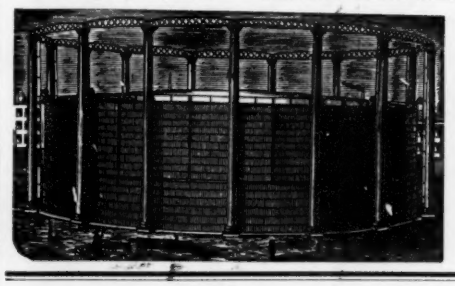
Valves,

Hydraulic Hoisting Purifier Carriage, Self-Sealing Retort Lids, Improved Valve Stand and Indicator, Seller's Cement.

Plans, Specifications, and Estimates furnished for Construction of New or Alteration of Old Works.

CONTINENTAL IRON WORKS.

THOS. F. ROWLAND, Prest. WARREN E. HILL and CHAS. H. CORBETT, V-Prests. THOS. F. ROWLAND, JR., Sec. & Treas.



P. O. Station G., BROOKLYN, N. Y.

ENGINEERS AND MANUFACTURERS OF

Gas Holders

CONDENSERS, SCRUBBERS, VALVES,

PURIFIERS, SELF-SEALING RETORT LIDS,

Hydraulic Mains,

And all other articles connected with the manufacture and distribution of Gas.

H. RANSHAW, Prest. & Mangr. WM. STACEY, Vice-Prest. T. H. BIRCH, Asst. Mangr. R. J. TARVIN, Sec. & Treas.

STACEY MFG. CO.,

MANUFACTURERS OF

Single and Telescopic Gasholders,

IRON ROOFS, BRIDGES, LAMP POSTS,

Water and Oil Tanks, Coal Elevator Cars,

COKE CRUSHERS, BENCH CASTINGS,

And all kinds of Wrought and Cast Iron Work used in the erection of Coal and Oil Gas Works. Rolling Mill Machinery and Heavy Castings a Specialty.

Foundry: 33, 35, 37 & 39 Mill Street. **Wrought Iron Works:** 16, 18, 20, 22, 24 & 26 Ramsey Street.

Cincinnati, Ohio.

Bouton Foundry Co.,

FOUNDERS AND MACHINISTS,

CHICAGO, ILL.

Gas Works Apparatus,

PURIFIERS, CONDENSERS,

Bench Work

SPECIALS, LAMP POSTS,

SCRUBBERS,

Iron Roofs and Floors.

Plans and Estimates furnished for new works or extensions of old works.

1842. **DEILY & FOWLER,** 1891.

Laurel Iron Works.

Address, No. 39 Laurel Street, Philadelphia, Pa.

BUILDERS OF

GASHOLDERS,

Single and Telescopic.

Holders Built 1885 to 1890, Inclusive:

Omaha, Neb.	Port Chester, N. Y.	Paducah, Ky.	Tacony, Pa. (two)	Central Gas Lt. Co., New York City (2d)
Scranton, Pa. (2d)	New Rochelle, N. Y.	Norwich, Conn.	Mount Vernon, N. Y.	Tacoma, Wash.
Long Island City, N. Y.	Salem, N. J. (3d)	Seattle, W. T.	Binghamton, N. Y.	Knoxville, Tenn.
Macon, Ga.	Omaha, Neb. (2d)	San Diego, Cal.	Concord, N. H.	Pottstown, Pa.
York, Pa.	Lynn, Mass. (2d)	Northern Gas Lt. Co., of New York, N. Y.	Dover, Del. (2d)	Victoria, B. C.
Chester, Pa.	Little Rock, Ark.	Westerly, R. I.	Calais, Me.	Vancouver, B. C.
Hazleton, Pa. (2d.)	Irvington, N. Y.	Willimantic, Conn	New London, Conn. (2d)	Charlottesville, Va.
Staten Island, N. Y.	South Boston, Mass.	Montclair, N. J.	West Chester, N. Y.	So. Framingham, Mass.
Saugerties, N. Y.	Rye, N. Y. (2)	Attleboro, Mass.	Bay Shore, L. I.	Woonsocket, R. I.
Clinton, Mass. (Lan. Mills)	Woodstock, Ont.	Santa Cruz, Cal.	Washington, D. C.	Simcoe, Can.
Chattanooga, Tenn.	Malden, Mass.	Erie, Pa. (2d)	Newport, R. I. (2d)	Pittsfield, Mass. (2d)
Galveston, Texas. (3d.)	Staten Island, N. Y. (2d)	West Chester, Pa. (2d	Morristown, N. J.	Chattanooga, Tenn. (2d)
Fort Plain, N. Y.	Woodstock, Ont.	Lancaster, Pa. (3d	Lebanon, Pa.	
Brunswick, Ga.	Malden, Mass.		Oakland, Cal.	

WM. HENRY WHITE,

No. 32 Pine Street, - - - New York City.

ENGINEER AND CONTRACTOR FOR THE

ERECTION AND EXTENSION OF

GAS, WATER, AND ELECTRIC LIGHT WORKS.

Correspondence with Gas Companies contemplating extending or improving their Plants respectfully invited.
Plans and Estimates Furnished.

GAS COALS. CANNEL COALS. GAS ENRICHERS.

JAMES D. PERKINS. **PERKINS & CO.,** F. SEAVERNS.

228 & 229 Produce Exchange, New York.

Cable Address, "PERKINS, NEW YORK." Post Office Box 3695, New York.

GENERAL SALES AGENTS FOR

The Youghiogheny River Coal Company's

OCEAN MINE YOUGHIOGHENY GAS-COAL.

HON. W. L. SCOTT, Prest. M. H. TAYLOR, Vice-Prest.

This Colliery is located at SCOTT HAVEN, PA., in the center of the Youghiogheny Gas Coal District, and produces the ONLY RELIABLE YOUGHIOGHENY COAL for gas purposes. (See Map on p. 87 of this JOURNAL, Feb. 16, '85.)

POINTS OF SHIPMENT,

Locust Point, BALTIMORE. Pier No. 62, PHILADELPHIA.

Also, SOLE AGENTS for the

BRECKENRIDGE CANNEL,

OF KENTUCKY.

Within the past two years we have delivered this Cannel to over ONE HUNDRED COMPANIES IN THIRTY-THREE DIFFERENT STATES, and it is now in use in some of the large Gas Works

On the Continent and in South America,

where it successfully competes with the Australian Shale. It is the ONLY AMERICAN GAS CANNEL of sufficiently high grade to warrant EXPORTATION TO EUROPE AND SOUTH AMERICA, and it is the only economical substitute for OIL OR NAPHTHA. ONE GROSS TON will produce

10,000 Cubic Feet of 75 Candle Gas,
or 12,500 " " 60 " "
or 15,000 " " 50 " "
} equal to { 750,000 Candle Feet of Gas, and 26 Bushels of merchantable Coke weighing 900 Pounds

This is the ONLY GAS CANNEL that will produce a REALLY MERCHANTABLE COKE. It can be delivered in parcels of one carload or more to any point in the United States or Canada. Cargo shipments of any size required can be made from NEW YORK, PHILADELPHIA, BALTIMORE, or NEWPORT NEWS. Samples will be sent and particulars of price, etc., forwarded upon application to above address.

JAMES & WILLIAM WOOD,

Gas and Cannel Coal Contractors,

No. 40 St. Enoch Sq., Glasgow. No. 2 Talbot Court, London.

Proprietors of the BATHVILLE COLLIERIES (which produce the celebrated BOGHEAD CANNEL), Shields, Shieldmuir, Drumpeller, and other Collieries. This Firm offer

STANDARD CANNELS,

Unequaled as Gas Enrichers.

Analyses, prices, and all further information furnished on application to

Agency for U.S., Room 70, Nos. 2 & 4 Stone St., N.Y. City.

The Standard Oil Company,

REFINERS OF

NAPTHA AND GASOLINES.

ALSO MANUFACTURERS OF

A Special Grade of Naptha for Gas Companies

FOR ENRICHING COAL GAS.

Correspondence solicited.

No. 43 Euclid Avenue, Cleveland, Ohio.

To Gas Companies.

We make to order CAP BURNERS to burn any amount under a stated pressure. Send for samples.

Also, SERVICE CLEANERS, DRIP PUMPS, and STREET MAIN PROVING APPARATUS.

C. A. GEFRORER,

248 N 8th Street, Phila. Pa.

COKE CRUSHERS. GAS COALS. GAS COALS.

The Despard Gas Coal Co.,

MINERS AND SHIPPERS OF

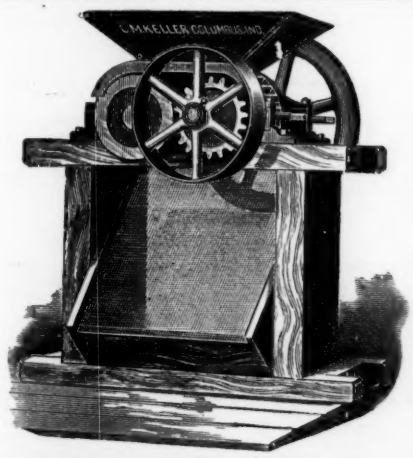
DESPARD GAS COAL,

AND MANUFACTURERS OF

COKE.

MINES, Clarksburg, Harrison Co., W. Va.
WHARVES, Locust Point, Baltimore, Md.
OFFICE, 44 South Street, Baltimore, Md

ROUSSEL & HICKS, 71 Broadway, N. Y. } AGENTS. { BANGS & HORTON, 60 Congress St., Boston



Keller's Adjustable Coke Crusher.

SIMPLE, STRONG, AND DURABLE.

C. M. Keller, Sec. & Supt. Gas Lt. & Coke Co. Columbus, Ind.

Correspondence Solicited.

Practical Electric Lighting.

By A. BROMLEY HOLMES, A.M.I.C.E.

With 87 Illustrations. Third Edition. Price, $1.00.

Electric Light Primer.

By CHARLES L. LEVEY.

A simple and comprehensive Digest of all the most important facts connected with the running of the Dynamo and Electric Lights, with Precautions for Safety, etc.

Price, 50 cents.

A. M. CALLENDER & CO., 42 Pine St., N.Y

THE PENN GAS COAL CO.

OFFER THEIR

Coal, Carefully Screened & Prepared for Gas Purposes.

Their Property is located in the Youghiogheny Coal Basin, near Irwin and Penn Stations on the Pennsylvania Railroad, and on the Youghiogheny River.

Principal Office:

209 SOUTH THIRD STREET, PHILA., PA.

Points of Shipment:

Pennsylvania Railroad Piers; Greenwich Wharves, Delaware River: Pier No. 1 (Lower Side), South Amboy, N. J.

Chesapeake & Ohio Railway Coal Agency,

FOR THE SALE OF THE

Superior Kanawha Gas Coals, Cannelton Cannel,

Also, SPLINT AND STEAM COALS,

From the Kanawha and New River Regions, on the line of the Chesapeake & Ohio R'way.

C. B. ORCUTT, General Agent, - - No. 1 Broadway (Room 217) New York City

FRANCIS H. JACKSON, Prest. EDMUND H. MCCULLOUGH, V.-Prest. CHAS. F. GODSHALL, Treas. H. C. ADAMS, Sec.

THE WESTMORELAND COAL CO.

Chartered 1854.

Mines situated on the Pennsylvania and the Baltimore and Ohio Railroads, in Westmoreland County, Penn.

POINTS OF SHIPMENT:

PHILADELPHIA, BALTIMORE, SOUTH AMBOY, N. J.
WATKINS (SENECA LAKE), N. Y.

Since the commencement of operations by this Company its well-known Coal has been largely used by the Gas Companies of New England and the Middle States, and its character is established as having no superior in gas-giving qualities, and in freedom from sulphur and other impurities.

Principal Office, 224 South 3d St., Phila., Pa.

THE CLERK GAS ENGINE CO.,

Main Office, 1012, 1014, 1016, 1018 Filbert St., Philadelphia, Pa.

WM. W. GOODWIN, Prest. E. STEIN, Sec.

The utility and convenience of the Gas Engine being no longer an open question, it only remains now for intending purchasers to select the BEST. We claim for the CLERK GAS ENGINE that it is equal to any other manufactured as regards steadiness in running, simplicity, and ease of keeping in repair, and that it gives the greatest amount of power for the least money (both in first cost and expense of running) of any engine made. In support of this claim we refer to the test of the Gas Engines made under the direction of the American Institute of New York, in December, 1885, and heretofore published in these columns. These engines are especially adapted for continuous running under heavy loads, and we can refer to Engines which have run 22 hours a day for months at a time

Made in Sizes of 5 10. 15 20. and 25 Horse Power. All Engines Guaranteed for One Year.

JOHN J. GRIFFIN & CO.,

Nos. 1513, 1515, 1517 & 1519 Race Street, PHILADELPHIA.
52 Dey St., NEW YORK. 75 N. Clinton St., (FRED. R. PERSONS, Mangr.) CHICAGO.

MANUFACTURERS OF

METERS FOR MEASURING GAS

IN ANY VOLUME.

Provers, Gauges, Registers, Etc., Etc.

EXPERIMENTAL APPARATUS FOR QUANTITATIVE AND QUALITATIVE ANALYSIS.

Careful and Prompt Attention paid to Repairing of all kinds of Meters and Apparatus.

Estimates Cheerfully Furnished.

Dry Gas Meters.

With 40 years' experience and the best facilities for manufacturing, is enabled to furnish reliable work and answer orders promptly.

NATHANIEL TUFTS,

No. 153 Franklin Street, Boston, Mass.,

MANUFACTURER OF

DRY GAS METERS.

Station Meters of any Capacity.

Test and Experimental Meters, Pressure Registers, Pressure Gauges Pressure and Vacuum Gauges.

METER PROVERS, PHOTOMETERS, STREET LANTERNS, ETC., ETC.

Patent Cluster Lanterns for Street Illumination.

CHARLES E. DICKEY. JAMES B. SMALLWOOD. CHARLES H. DICKEY.

THE MARYLAND METER AND MANUFACTURING CO.

Established 1866.

BALTIMORE, North & Saratoga Sts. **CHICAGO, 197 Michigan Street.**
NEW YORK, 838 Broadway. **SAN FRANCISCO, 221 Front St.**
BOSTON, 92 Water Street, Rooms 21 and 22.

CONSUMERS' & STATION METERS, PRESSURE GAUGES, Etc., Etc.

"Success" and "Perfect" Gas Stoves.

A. HARRIS. E. L. HARRIS. J. A. HARRIS.

Established 1849.

HARRIS BROS. & CO.,

Twelfth and Brown Streets, Philadelphia.

Manufacturers of Wet and Dry Gas Meters,

STATION METERS, METER PROVERS,

EXPERIMENTAL METERS, SHOW OR GLAZED METERS

Pressure and Vacuum Registers, Gauges, Photometers, Drip and Bell Pumps, Etc., Etc.

PROMPT ATTENTION GIVEN TO ALL ORDERS. METERS THOROUGHLY REPAIRED. ESTIMATES FURNISHED FOR STATION METERS OF ALL SIZES. CORRESPONDENCE SOLICITED.

GAS METERS. GAS METERS. GAS METERS.

GEO. J. McGOURKEY, Prest. WM. H. McFADDEN, Vice-Prest. (Phila.) WM. N. MILSTED, Gen. Supt. and Treas. (New York). WM. H. DOWN, Sec.

THE AMERICAN METER CO.

Established 1834. Incorporated 1863.

WET AND DRY GAS METERS. PRESSURE REGISTERS. METER PROVERS.
STATION METERS. PRESSURE & VACUUM REGISTERS. PORTABLE TEST METERS.
EXHAUSTER GOVERNORS. PRESSURE & VACUUM GAUGES. EXPERIMENTAL METERS.
DRY CENTER VALVES. CRESSON GAS REGULATORS. AMMONIA TEST METERS.
GOVERNORS FOR GAS WORKS. MARSLAND WATER METERS. BAR & JET PHOTOMETERS.

Manufactories:
512 West 22d St., N. Y.
Arch & 22d Sts., Phila.

GAS STOVES.
SUGG'S "STANDARD" ARGAND BURNERS,
SUGG'S ILLUMINATING POWER METER,
Wet Meters, with Lizar's "Invariable Measuring" Drum.

Agencies:
177 Elm Street, Cincinnati.
244 & 246 N. Wells Street, Chicago.
810 North Second Street, St. Louis.
222 Sutter Street, San Francisco.

HELME & McILHENNY,

(Established 1848.)

GAS METER MANUFACTURERS,

Nos. 1339 to 1349 Cherry Street, Philadelphia, Pa.,

WET AND DRY GAS METERS. STATION METERS, EXPERIMENTAL METERS, METER PROVERS,

Center Seals, Pressure Registers, Governors, Indicators, Photometers, and all other kinds of Apparatus for use in Gas Works.

FOULIS' PATENT STATION AND DISTRICT GOVERNORS.

REPAIRING DEPARTMENT.—We employ a special force of skilled workmen repairing meters of **all makers.**

WM. WALLACE GOODWIN, President and Treasurer. E. STEIN, Vice-President. H. B. GOODWIN, Secretary and Superintendent.

THE GOODWIN GAS STOVE AND METER CO.,

Successors to W. W. GOODWIN & CO.

1012, 1014 & 1016 Filbert St., Phila., Pa. 113 Chambers St., N. Y. City. 44 & 46 Dearborn St., Chicago, Ills.

WALDO BROTHERS, Agents, 88 Water Streets, Boston, Mass.

MANUFACTURERS OF

DRY AND WET GAS METERS,

Station Meters (square, cylindrical, or in staves), Glazed Meters, King's and Sugg's Experimental Meters, Lamp Post Meters, etc., etc. Meter Provers (sizes 2, 5, and 10 feet), Pressure Gauges of all kinds, Pressure Registers, Pressure and Vacuum Registers, Pressure Indicators (sizes 4, 6, and 9 inch), King's Pressure and Vacuum Gauges, Dry and Wet Center Seals, Dry and Wet Governors, Exhauster Governors, Photometers of all descriptions. Letheby's Sulphur and Ammonia Test Apparatus complete. Also, Testing and Chemical Apparatus of all kinds, and of the most perfect description, for all purposes relating to Gas.

Manufacturers of the "SUN DIAL" GAS STOVES, for Cooking and Heating.

Goodwin's Improved Lowe's Jet Photometer. **Agents for Bray's Patent Gas Burners and Lanterns.**

Special attention to Repairs of Meters and all Apparatus connected with the business. All work guaranteed first-class in every particular. Orders filled promptly.

G. B. EDWARDS, Manager, New York. S. S. STRATTON, Manager, Chicago.

D. McDONALD & CO.,

GAS METER MANUFACTURERS.

(Established 1854.)

51 Lancaster St., Albany, N. Y. 34 & 36 West Monroe St., Chicago, Ill.

STATION METERS, EXPERIMENTAL METERS, METER PROVERS, PRESSURE & VACUUM REGISTERS, PRESSURE GAUGES, ETC.

Also STAR GAS STOVES, RANGES, and HEATING STOVES.

We use only the very best materials, and employ the most skilled labor, and by our long experience (36 years) and personal supervision of every detail we feel justified in assuring the public that our goods will give perfect satisfaction. Every Meter emanating from our establishment will bear the State Inspector's Badge, and will be fully warranted by us. Our Annual and Calendar will be sent to Gas Companies upon application.

WM. WALLACE GOODWIN, President. E. STEIN, Vice-President. H. B. GOODWIN, Sec. & Supt. G. B. EDWARDS, Mang'r, New York. S. S. STRATTON, Mang'r, Chicago.

THE GOODWIN GAS STOVE AND METER CO.,

1012, 1014 & 1016 Filbert St., Phila., Pa. 113 Chambers St., N. Y. City. 44 & 46 Dearborn St., Chicago, Ills.

Agents, WALDO BROTHERS, 88 Water Street, Boston.

SOLE MANUFACTURERS OF THE

"SUN DIAL" GAS STOVES,

The Most Economical, Efficient, and Durable Gas Stove Made.

GAS COOKING STOVE, No. 8 C.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
37 in. high.	12 in. high.	12 in. high.	24 in. long.	36 in.
20 in. wide.	17½ in. wide.	18 in. wide.	21 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has four burners on top, and double oven burner.

Consumption of gas with all burners in use, 42 feet per hour, at 1 inch pressure.

The top is made in sections, so that a greater variety of cooking utensils may be used. By lifting out the covers and crosspieces and putting in a suitable forked ring, which is sent with each stove, a wash boiler or other large utensil may be set over two burners. Our **No. 87 GRIDDLE** also fits in the same position. The roasting oven is provided with a cast-iron door.

All Fittings are Nickel-Plated.

GAS COOKING STOVE, No. 7 B.

SIZE.

Stove.	Oven.	Roaster.	Top.	Length over Extension Shelves,
31 in. high.	9½ in. high.	10 in. high.	21 in. long.	32 in.
17 in. wide.	14⅛ in. wide.	15 in. wide.	16 in. wide.	
	12 in. deep.	13 in. deep.		

This Stove has three boiling burners in the Top or Hot Plate, and one single oven burner.

This cut represents our New Style Cooking Stove. As will be seen, it has an ornamented cast-iron Base and Front, and extension shelves. The Oven Burner, which is atmospheric (unless otherwise ordered), is of an entirely new and improved pattern (patent). The ovens are of greater capacity than those of the old style. The Top, in conjunction with the Outlet Pipe, is designed to carry off all the products of combustion, if desired, but they are also supplied with a loose ring which converts it into an ordinary open top stove.

The consumption of this Stove is 35 cubic feet per hour at 1 inch pressure, with all Burners in use.

All Fittings are Nickel-Plated.

"RADIANT" BOILING STOVE, WITH REGENERATIVE BURNER.

Size, 6¼ inches diameter, 8 inches high. Consumption, 6 feet per hour at 1 in. pressure.

HOT PLATE, No. 111.

Size, 36 in. long, 12 in. wide, with three double burners, 6 taps.

Consumption, with all burners in use, 36 cubic feet per hour, with 1 in. pressure.

¼ in. supply pipe should be used where the pressure is 1 in. or over.